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A COMPLETE
SYSTEM OF NURSING

A COMPLETE SYSTEM OF NURSING

by

A. MILLICENT ASHDOWN, S.R.N.

CERTIFICATED KING'S COLLEGE HOSPITAL
AND ROYAL LONDON OPHTHALMIC HOSPITAL, MOORFIELDS
FORMERLY EXAMINER IN NURSES' PRACTICAL WORK TO CHARING CROSS HOSPITAL
AND ESSEX COUNTY COUNCIL, WELLHOUSE HOSPITAL, BARNET, THE
GENERAL NURSING COUNCIL, THE LONDON COUNTY COUNCIL,
MIDDLESEX COUNTY COUNCIL, ETC., AND LECTURER TO THE
NURSES IN BANDAGING AND PRACTICAL WORK,
KING'S COLLEGE HOSPITAL

WITH NUMEROUS ILLUSTRATIONS
DIAGRAMS & GLOSSARY

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PREFACE TO THE 1940 EDITION

It is very gratifying to find this book in such demand. The numerous letters of appreciation I have received both from nurses and doctors at home and abroad have given me much pleasure.

The present edition has been entirely revised and reset in order to bring it up to date. New methods in the treatment of fractures, including treatment by application of plaster casts instead of wooden splints, extension by skeletal traction, horizontal extension, and treatment of fractures by surgical pin are dealt with fully and with many helpful diagrams and photographs. Oxygen tent and Drinker Respirator are both illustrated and described. Chemical warfare and the treatment and prevention of gas casualties are given. Newer methods of administering anaesthetics are included. The chapter on Diseases of the Endocrine Glands has been rewritten and brought up to date. Newer treatments, such as Hyperthermia, Foam Baths, and new methods of Blood Transfusion and Intravenous Saline Infusions are given in detail. Allergic Diseases and Antivitaminosis are amongst some of the newer medical diseases described. A completely new chapter on Bacteriology up to the standard required for the State examination has been added, also a new chapter on Radium treatment and the newer X-ray treatments and examinations. The chapter on Diets has been rewritten and brought up to date with diets now in force. Some of the recent new operations are also described, such as Cardio-Omentopexy for Angina Pectoris, Thyroidectomy, Ramstedt's operation, etc.

My aim has been to place before the nurse a short account of the different diseases—as without an elementary knowledge of such, intelligent nursing cannot be carried out—their prominent symptoms and chief points of distinction, their possible complication, the nursing attention required, and the treatment likely to be given by the physician and surgeon, in order that suitable preparation may be made by the nurse. I have endeavoured to supply such information as will instruct the nurse how to carry out any, and every, nursing duty, and to meet the various emergencies that are likely to arise, but I wish most emphatically to point out that it is not intended to suggest that the nurse should act upon her own responsibility, prescribe or omit drugs, etc., or in any way alter or order treatment except under circumstances of extreme urgency.

A feature which I hope will prove especially useful will be found in the direction of how to apply many forms of treatment that may be prescribed, and to prepare the patient for examination, operation, or other treatment performed by the physician and surgeon. The knowledge required for nurses in practical examinations has also been included.

My sincere thanks are due to the under-mentioned members of the medical profession who have kindly read over the chapters dealing with their particular specialities, rendering assistance and giving advice, thereby greatly enhancing the value of the work: Sir St. Clair Thomson, Sir Charlton Briscoe, Mr Cargill, Mr Carless, Mr Clayton, and others.

Mr Stebbing, F.R.C.S., Surgeon Specialist to the London County Council, has kindly given valuable advice and read through the entire revision. The new chapter on Bacteriology has been written by Dr Hewlett, Group Pathologist, Lambeth L.C.C. Hospital. Miss Bate, Sister-in-Charge, Radio-Therapeutic Department, Lambeth L.C.C. Hospital, has rewritten the chapter dealing with Radium, X-Ray, and Light treatment.

Dr R. D. Lawrence has kindly given permission to include his Diabetic 'Line Ration' Scheme.

I have also to thank the following members of the medical and nursing professions for help: Miss Bleazby, Sister-Tutor, Lambeth L.C.C. Hospital; Miss Davies, Theatre Sister, Charing Cross Hospital, for instrument sets; Miss Armstrong, for her notes on Chemical Warfare; Mr James, F.R.C.S., Central Middlesex County Hospital, for photographs of the Böhler treatment of fractures using Braun splints; Mr Bailey, F.R.C.S., St Leonards L.C.C. Hospital, for photograph of Thomas's extension splint applied; Dr H. O. West, Medical Superintendent, Queen Mary's Hospital, Carshalton (L.C.C.), for photographs of Pugh's frames for hip and spinal disease.

The following firms have also assisted by the loan of blocks: Messrs Down Bros, all the instrument blocks; Smith & Nephew

Ltd, Cellona plaster of paris technique and illustrations; W. Masters & Sons, photograph of an inguinal truss applied; Chas F. Thackray, St George's Hospital oxygen tent; Messrs. Baillière, Tindall & Cox; Siebe, Gorman & Co. Ltd, Drinker respirator, and gas-mask.

My thanks must also be accorded to the publishers, who have given me every assistance.

Books used for reference, and which should be consulted for further information: *Gould's Medical Dictionary*, Scott and Brownlow; *Allergy*, G. H. Oriel; *The Diabetic Life*, Lawrence; *Handbook of Diets*, Rose Simmonds; *Constipation and Allied Disorders*, Hurst; *Anatomy, Physiology, and Hygiene*, Ashdown and Bleazby.

A. MILLICENT ASHDOWN.

BURNDELL, YAPTON,
SUSSEX.

PREFACE TO THE 1943 EDITION

I WAS much gratified when I received news from the publishers that permission had been granted to reprint the book during wartime.

To bring the book up to date the revision has necessitated many additions and alterations, and, in order to conform with book production war economy standard, the arrangement of the plates has had to be altered.

Amongst the chief additions are the following: new classification of burns with new treatments by coagulation, irrigation envelope, and baths; the administration of oxygen by B.L.B. mask and also with Orbito catheter spectacles; new blood grouping and newer methods of transfusion of blood and its derivatives; modern method of bandaging and exercising the amputation stump; bandage for fracture of the jaw together with the positions adopted whilst moving the patient before fixation; three-handkerchief slings for fixation of a fracture of the clavicle; Thomas's collar and cuff sling for fixation of a fracture of the neck of the humerus; bone graft for the repair of fractures and the fixation of deformed and painful joints; walking plaster with rockered boot in place of walking-iron; Sternol paraffin wax baths. Vitamins have been brought up to date, and their chemical names are given as well as their letters. Some of the more recent operations, such as sympathectomy and arthrodesis, are mentioned. The rules and regulations from the Dangerous Drugs Act have been given fully and brought up to date.

My thanks are due to the following members of the medical profession for their kind and valued help: Surgeon Rear-Admiral Cecil Wakeley, C.B., F.R.C.S., for the treatment of burns; Brigadier Rowley Bristow, F.R.C.S., and the staff of St. Nicholas's Orthopaedic Hospital, Pyrford, for the following photographs: B.L.B. oxygen mask applied, Orbito oxygen catheter spectacles, X-ray of bone graft, Thomas's collar and cuff sling applied, three-handkerchief slings fixation for fracture of the clavicle, walking plaster with rockered boot; Dr. Craft, Ministry of Pensions, Roehampton, for treatment of the amputation stump; Dr. Hewlett, Group Pathologist, Lambeth L.C.C. Hospital for notes on chemotherapy, including penicillin and D.D.T. powder.

The following firms have kindly lent blocks for illustrations: Stannard's irrigation envelopes; 'Harrisons' Opticians, Orbito spectacles; Down Bros.

My thanks must also be accorded to the publishers, who have helped me in every way in spite of working under wartime restrictions.

A. MILLICENT ASHDOWN.

LITTLE BURNDELL,
WEST WALBERTON LANE,
ARUNDEL,
SUSSEX.

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CHAPTER I

THE NURSE

THE three following qualifications are essential to the making of a good nurse:

1. A real love of attending to the sick and helpless;
2. A strong constitution;
3. An equable temperament.

Only those possessing these qualifications should attempt to train as nurses, as the life is a strenuous one. Moreover, to those who are not fitted for it, many of the duties are revolting and therefore difficult to accomplish satisfactorily.

It must be borne in mind that a sick person is more difficult to deal with than a healthy one, and that the disposition of the person almost always changes in sickness (p. 410).

Nurses who are training must remember the following points as essential to good work:

A nurse must be punctual, good tempered, obedient, and loyal to all rules as the foundation of her work. She must also be active, yet quiet and deft; methodical, reliable, careful, clean, and neat; observant, intelligent, and economical; possessed of self-control, persevering gentleness, tact, sympathy, and common sense; careful to respect professional etiquette, remembering what is due to those in authority; courteous in manner and in attention to visitors and patients' friends (a duty that nurses in the pressure of their work are apt to overlook); careful to wear her uniform with spotless cleanliness, neatness, and simplicity, with hair tidy, no jewellery, her general bearing that of military smartness; careful to be guarded in her behaviour towards doctors and students.

Nurses should always remember the sacredness of their profession, and hold it in such respect that they will never bring discredit on their uniform.

They should not discuss members of the medical staff, ward sisters, or other officials of the institution, fellow-nurses, the patients and their diseases, or any matter connected with their training and work either at meals, in public thoroughfares, omnibuses, shops, or such-like places.

They must ever remember that discipline and obedience are the keynote to satisfactory and efficient work in life; for to rule well we must first learn to obey.

They should bear in mind that they must be loyal, generous, tender, and gentle, yet strong in action and thought, cheerful and bright, but avoiding any remark that would tend to detract from the delicacy and refinement of their work.

They must look upon their patients as individuals to be cared for personally, not merely as 'cases' to be treated medically.

On no account should terms of endearment be used when addressing a patient. Many patients resent this familiarity, and all realize that it is merely a form of speech, or habit, and most undesirable.

Nurses should recognize that it is a characteristic of nursing work either to bring out all that is great, noble, and self-sacrificing, or to tend to deterioration by affording opportunities for selfishness, liberty of action and thought, and frivolous amusement; thereby bringing either credit or discredit upon the school which has trained them, the influence of which they will carry with them so long as they do nursing work within or without its walls.

Those who are trained should never lose sight of the fact that every nurse is a representative of her hospital. When undertaking private work the nurse should observe the following rules:

1. To dust the sick-room, wash and cleanse all utensils used by the patient, and never to refuse to do domestic work in exceptional cases of extreme illness, infectious disease, or straitened circumstances; to make her own bed and keep her bedroom tidy.
2. To maintain her position as a nurse pleasantly but firmly when brought in contact with the servants of the household.
3. To practise economy in the use of requisites for the sick-room, and to try and adapt other than the usual articles to her work if unable to procure what is wanted, or if it is necessary not to incur further expense.
4. In discharging her duties as a nurse not to forget the sympathy due to suffering and sorrow.

All nurses are not suited to undertake any kind of nursing. The best and most successful nurse is the one who undertakes that kind of nursing to which she is most suited; therefore when the period of training is finished she should take up the particular branch of work in which she excels and to which she is best adapted.

Nurses' Uniform.—The dress should be made of print or some suitable washing material, which when ironed will present a smooth surface. It should be made up in the simplest manner, and must be sufficiently short to clear the ground. The sleeves must be made to turn up to the elbow, and white linen sleeves or cuffs should be worn, also a large white apron and a plain white washing cap over the hair. Quiet shoes with rubber heels are a necessity.

Modern uniform is often reduced to white drill dress-overall with short sleeves, detachable linen sleeves being worn when not working, white cap, and either white or black shoes and stockings.

A serge or an alpaca dress should be worn when in outdoor uniform; otherwise an indoor uniform dress without apron may be worn, but it should be kept for use out of doors and changed before going into the sick-room. If the dress worn in the sick-room is worn out of doors, it becomes contaminated with dust and mud and is no longer a fit garment for the sick-room.

Cleanliness.—The nurse should be, and, to do her justice, she usually is, an example of perfect neatness and cleanliness. In nursing, cleanliness is not merely a matter of taste—the natural outcome of good breeding and good manners—but a duty involving a real and very important professional obligation. The importance of this is emphasized when one realizes that practically all the triumphs of modern surgery have been achieved through the adoption of a scientific system of cleanliness. The general public, including the most refined classes who have a horror of all visible dirt, have but a faint idea of what is meant by 'surgical cleanliness.' It is therefore the duty of the trained nurse to educate up to the scientific standard those among whom she is working, and her example will do much. With this knowledge the nurse should practise cleanliness as a matter of honour. Every vestige of dirt, whether visible or not, must be removed, particular care being taken in regard to the hands and nails. Every article of attire should be washable, and frequent changes should be made. A soiled pocket-handkerchief should never be tolerated. The teeth must receive careful attention night and morning, and an antiseptic dentifrice should be used. A daily bath with the free use of an antiseptic soap is a necessity, while if a bath is unavailable the best substitute must be employed.

Good health and the absence of any of the following conditions are essential: Decayed teeth; offensive nasal discharge; otorrhoea (p. 187); bromidrosis (p. 412); or any other unhealthy taint. Scent or strongly-scented soap should not be used as it is most unpleasant to the patient. The hygiene of the nurse is as important as the hygiene of the sick-room.

Hygiene of the Sick-room.—The nature of the place where the patient is to be nursed is an important matter, but it is not as a rule one which the nurse has to determine. The following points should be observed in regard to the sick-room.

Drainage.—In many houses the drainage is far from perfect;

and where such is the case the patient must be protected against injury from this unfavourable condition.

If a fault in the drainage is suspected, an easy way to make a test is to pour a teaspoonful of oil of peppermint down the pan of the water-closet, taking care not to spill a drop elsewhere. The closet door should then be shut, and the house carefully explored to see if any smell of peppermint can be detected arising from the cracks in the floor, waste pipes of sinks, baths, etc. The person who has been in contact with the peppermint should not be the one to explore. If a defect be discovered in the drainage system, the nurse should at once report the fact to the patient's friends, and transfer her responsibility by promptly reporting the state of things to the physician in charge of the case. If practicable, the patient should be removed; but if this is impossible, or pending removal, the following precautions should be taken.

All drinking water must be boiled and filtered. A filter recently filled with charcoal should be used—a Berkefeld filter or any equally reliable. The nurse should prepare a reliable disinfectant of suitable strength and flush down the drains with it two or three times a day.

Izal, Jeyes's fluid, carbolic (1–20), and perchloride of mercury (1–1000) are reliable disinfectants. The two last drugs, being poisonous, should only be handled by the nurse.

Dustbins or refuse of any kind must not be kept anywhere near the sick-room windows.

The Sick-room.—The upper part of the house, or a separate wing, is the best position for the sick-room. The air is purer, ventilation easier, and in infectious cases an upper room is more easily isolated, and is farther away from the cooking and food supply. It is also much quieter.

A room having a southerly or south-westerly aspect is the best, but this is not always procurable. The room should have one large or two smaller windows. It is an advantage in many ways to have a room opening into it, and, if possible, a lavatory on the same floor. It should be the nurse's aim from the moment of entering on her duties to keep the surroundings of her patient clean and healthy; and if all the above desirable conditions are to be obtained it should be an easy matter. It is, however, in small houses, or in the dwellings of the poor, where the patient inhabits a dark and close or squalid chamber, that her resources are tried to the utmost and her skill and efficiency are put to the severest test.

But although it is impossible to have the patient in the ideal surroundings, a good nurse will be able to make the best of what she has; and, once she realizes in what the sick-room is lacking, or in what way it is unsuitable, she will improvise ways of counteracting the undesirable conditions and remedying the deficiencies, even though she cannot altogether alter them.

Ventilation.—This is one of the most important points as regards the hygiene of the sick-room, purity of the atmosphere being absolutely essential.

In providing for efficient ventilation, four points have to be considered:

1. The foul air must be eliminated.
2. Fresh air must be admitted.
3. Draughts must be avoided.
4. Inlet and outlet of air must be continuous.

In a private house the difficulties are far greater than in a hospital ward, the latter being specially constructed with a view to efficient ventilation.

Foul air is injurious to health, not so much because of the changes which have taken place in the relative quantities of the constituents of air, as because of the organic waste materials which are added during the process of respiration, and from the skin as well as from any wounds or discharges that are present.

For the removal of impure air one of the following plans may be adopted.

Foul air being lighter and warmer rises to the top of the room, it is therefore necessary to have an exit high up in the room. A ventilator fixed near the ceiling in communication with the outside air; a window open an inch or two at the top; and an open coal fire are all reliable means of getting rid of impure air.

A coal fire in an ordinary open grate is one of the most useful as it warms the room at the same time as ventilating it.

Owing to the weight of air of unequal temperatures being a great force, the tendency is for the air entering the room at various points to move towards the chimney. So much is this the case that when the chief inlet and the chimney are near together, and nothing intervenes to turn the current, a continuous draught may prevail between these two points without the rest of the air in the room undergoing much change. This may be avoided by arranging that the inlet is in such a position that to reach the chimney the air has to traverse the greater part of the room, and by the judicious arrangement of screens.

In providing an outlet for the air by means of the window, the top sash should be drawn down about two inches. If a choice of windows is possible, the one in the opposite direction to the wind is best. Except when a coal fire is burning day and night, this window must be kept open; it should, however, be closed just whilst the patient is uncovered, and reopened immediately. A wide-open window often causes less draught than a partially open one. Patients suffering from various diseases requiring abundance of fresh air are nursed with windows kept wide open night and day (p. 319).

In providing for an inlet for fresh air it must be such that pure air from outside is admitted direct, not through a door opening into another room or the landing.

In cases where it is not advisable to have the window open constantly, a good plan is to raise the lower sash of the window six or eight inches and place a board across the lower opening. In this way fresh air enters at the middle of the window, and is forced up, and so no draught is felt; this, with a window open an inch or two at the top, or with a fire burning, will keep the air of the room fresh and wholesome. The window must be kept in this position day and night, with the exception of the time when the patient is uncovered. It is often advisable, in addition to the constant ventilation, to give the room a thorough airing; this may be done once or twice during the warmest part of the day. The patient should first be well covered up with clothing, and protected from draughts with a screen; the window may then be opened wide, top and bottom, for a few minutes. It is advisable to leave the patient well covered until the air has again become warm.

Draught is best prevented by the means already referred to. If the patient is able to sit up by the fire, it will be necessary to place a screen between the door and the fireplace so that the draught from under the door is not felt. This is one of the most common and universal defects in the ventilation of small rooms. It will of course be necessary for the screen to reach to the floor.

With a change of wind it may be necessary to alter the ventilating arrangements; it is at such a time that the second window becomes useful. It must be remembered that mere deodorizers have no appreciable effect on disease germs. Above all, the nurse must never fall into the popular habit of smothering one smell with another. A foul atmosphere 'sweetened' with eau-de-Cologne, pastille smoke, or an aromatic deodorizer is evidence of incompetency on her part.

Windows in the landing and on the staircase should be kept open night and day as far as possible.

If there is any difference between the outdoor air and the indoor air, in point of freshness (not warmth), the house or room is not well ventilated.

Temperature.—The only reliable means of ascertaining the temperature of the room is by the use of a thermometer. There should always be one in the sick-room, hanging near the bed. The temperature should be kept as nearly as possible at 60° F. and on no account be allowed to descend below 50° F.; but children and old people need a warmer atmosphere, 65°–70° F., and in some diseases a higher temperature is required, 65°–75° F.; but this is a matter for the physician to decide. It is a good plan to note the reading of the thermometer three times a day, or every four hours, as the great point is to keep the room at an even temperature. (For thermometry see p. 853.)

Heating the room or raising the temperature is done by means of a fire, stove, or hot-water pipes. The latter are not usually sufficient alone. The fire may be either coal, in an open grate, or a stove. Anthracite should not be used in a sick-room. No gas or oil stove should be used unless all the products of combustion are carried up the chimney. A pan of water must be kept in front of the stove to reduce the dryness in the air which always occurs when a stove is in use. In every case where gas is laid on, the nurse should make quite sure there is no leakage, as even a very little coal gas mixed with air is very depressing to the invalid.

To keep the room at the correct temperature during hot weather, the windows will have to be kept wide open top and bottom; sun blinds, if obtainable, must be kept down whilst the sun is on the window. When there is no sun blind, the inside blind should be drawn down about three-quarters of its length and fastened to the curtain in such a way that the blind does not hang right against the window and so prevent the admission of air; fixing the blind in this way will also prevent it from flapping. If necessary the door can be propped open, and a screen used instead, but the landing on to which it opens must be well ventilated.

Cleanliness of the Room.—As a rule, except in some surgical cases, the nurse has no opportunity of preparing the room for the patient as he already occupies it; she can only do such cleaning and rearranging as are necessary for keeping the room healthy.

The best coverings for the floor are linoleum, and one or two small carpets. Carpets should not extend over the whole room, but be used as 'treads' to prevent unnecessary noise.

The bedstead should be narrow, with a woven wire mattress, covered with a hair or good flock mattress, encased in a washable cover (p. 20). The bedstead should be placed in such a position that only the head is against the wall. The position should be adapted to the situation of the windows when possible, so as to avoid facing the light. In the case of a convalescent, or a patient undergoing open-air treatment, the bed may be wheeled to the window so that the patient can see out.

The bedclothes should be light and warm. If required, a mackintosh sheet must be provided, so that the mattress does not become soiled.

Nothing whatever must be kept under the bed.

The furniture should be simple and there should be as little of it as is necessary to comfort; superfluous furniture should be removed. At the same time zeal must be tempered with discretion, and the room should not be rendered more bare and comfortless than the needs of the case demand.

The room should be cleaned and dusted every day. To avoid raising dust when sweeping, the floor should be swept after damp sawdust or tea leaves have been put down. If the floor is covered with a large carpet, it should be cleaned with an electric carpet sweeper, as this will prevent the dust rising, or rubbed over with a damp cloth, or brushed with a damp hand brush. The dust must not be allowed to accumulate under the bed or furniture, or in the corners of the room. If the floor is covered with linoleum it should be washed or rubbed over every morning instead of being swept. Small carpets can be removed for cleaning.

Blinds are a great source of dust unless properly cleaned; they should be rubbed on both sides with a damp cloth. Venetian blinds should be washed periodically and dusted every morning. Dusting should be done with two dusters, a damp one to remove the dust and prevent it flying from one place to another, and a dry one to polish after the damp one. Pictures need dusting every day back and front, and all ledges must be wiped down with a damp duster daily.

All toilet utensils must be thoroughly washed and cleansed each morning; this should be done by the nurse. Bedpans, urinals, and vomit bowls should be well disinfected each time after use, with carbolic or other reliable disinfectant. The excretions must on no account be allowed to remain in the room or hidden under the bed or in a commode. If needed for inspection, they should be removed to the lavatory, and kept covered, and arranged for easy inspection by the medical attendant.

Utensils used for food should be kept out of the room. If the room adjacent is available and unoccupied, they can be washed up and kept in there; they should always be covered over, and the nurse should wash them up after use herself. No food either solid or liquid should be kept in the patient's room; if the case is one where constant small quantities are required, the food can be kept covered, on the window-sill in the adjacent room, or on the landing window-sill, provided it is not near a lavatory. Medicine glasses must be washed directly after use, and medicines should be kept out of sight and reach of the patient (p. 758). All poisons must be kept under lock and key, the nurse keeping the key in her possession.

Flowers with suitable colours and devoid of strong scent should be selected, and should always be removed at night and have fresh water before being brought in again.

Quiet.—The nurse, as before stated, should never wear rustling dresses, creaking shoes, or shoes with noisy heels, and should avoid heavy and clumsy movements, as all these are extremely irksome to the patient. Windows must be wedged so that they do not rattle, and the door prevented from banging or rattling. In windy weather it is often difficult to prevent the door from creaking and rattling. A useful method is to have several thicknesses of material, made very like a kettle-holder, with loops of tape to fix on to the inside and outside handles; the door cannot then be latched but is rendered quiet. The fire must be attended to carefully and noiselessly; lumps of coal are better than small coal, as they can be lifted on separately with tongs or a glove. At night it is a good plan to wrap the coal in paper; it is then easy to pick it up in the dark. It is better to make the fire up last thing at night with damp slack; if it is well banked up at the back, with lumps in front, it will last many hours without attention.

Infectious Cases.—In the nursing of these cases, all the remarks already made will apply, but a few additions are necessary.

Isolation.—The sick-room should be as far away from others as possible. All unnecessary furniture must be removed, and a carpet should not be allowed.

A sheet kept wet with a disinfectant, such as carbolic (1–20), should be hung outside the door. An overall and overshoes for the medical attendant, or any other visitor who is allowed, should also be kept hanging near the door. The nurse should wear an overall, which she should remove on leaving the room and put on again before re-entering.

The room must be well ventilated, the windows being kept open, and when the season will permit a fire should be kept burning in the grate. The floor is to be cleaned every day, and sprinkled with a disinfectant. The door kept closed.

The feeding utensils will have to be kept in the room; they are covered over on a small table used solely for the purpose, and placed as near the window as possible. Should it be necessary to keep any milk, etc. used for food near at hand, it may be placed in a covered jug on the window-sill outside.

In these cases the nurse should attend to the cleaning of the room, and everything leaving the room must be thoroughly disinfected before being handled by other members of the household. (For the method of disinfecting linen, crockery, etc. see page 47.)

All discharges from the patient, phlegm, vomit, urine, and faeces, should be received into vessels containing a disinfectant, either fluid or powder. After use the vessel should have more disinfectant added before being carried to the lavatory; the vessel should also be covered with a cloth soaked in carbolic (1–20) before being taken out of the room. Pieces of rag, wool, or paper handkerchiefs used for wiping away discharges from the patient must be burnt immediately.

Before taking meals or leaving the room, the nurse must thoroughly wash and disinfect her hands and arms (p. 46). Unnecessary communication with other members of the household should be avoided. If, under exceptional circumstances, visitors have been allowed, they should be made to conform to the rules observed by those in attendance.

The patient is not allowed to mix with others until the medical attendant has given permission, and until he has been properly disinfected.

After disinfecting the patient, the nurse must attend to the disinfection of the room and its contents, and thoroughly disinfect herself and her belongings before leaving the case (p. 47). The nurse must observe the required period of quarantine (p. 331) before attending another case, unless it be one of the same nature.

CHAPTER II

GENERAL NURSING DUTIES

Hygiene of the Patient.—*Toilet.*—This includes the rendering and keeping clean of the skin, the mouth, the hair, and the nails; and in keeping all orifices free from accumulated discharges or excretions. It is one of the most important of a nurse's duties, and one which, if performed skilfully, will at once ensure the patient's gratitude and confidence. Only those who have experienced these services performed by a skilled and deft nurse, and by a careless and clumsy one, can realize the enormous difference that may be made to the patient's comfort and health.

The Blanket Bath.—Points to bear in mind when giving a blanket bath: Render every part of the body thoroughly clean and dry. Wash briskly (not roughly) with a plentiful supply of soap; rinse thoroughly; and dry by using moderate friction with a dry towel. A dabbing wash with a washing flannel wrung nearly dry, followed by gentle wiping, is both unpleasant and inadequate. Avoid undue exposure and chill. Use hot water, changing it at least once. Avoid tiring the patient, by bathing as quickly as is compatible with efficiency.

Requisites.—Long mackintosh; two bath blankets (two old blankets are preferable, but quilts, bath sheets, sheets, or large bath towels may be used); face towel; bath towel; soap, sponge, and washing flannels; wash-hand basin with hot water; jug of hot water; pail; nail scissors; bottle (corked) containing methylated spirit (eau-de-Cologne or other spirit may be used); dusting powder (equal parts of zinc oxide, starch, and boracic is the best); hair brush and comb, cape.

Method.—Having got everything in readiness, place the screens around the bed, or fasten the door if in a room; close the windows. Remove the upper bedclothes (p. 20) and cover the patient with one warmed blanket; roll the mackintosh and second warmed blanket under the patient (p. 20) so that the bed is protected. Remove the shirt or gown by unfastening it at the neck, next bring the back half up over the shoulders, slip out one arm, when the gown may be easily slipped over the patient's head and the other arm withdrawn. When one arm is injured, always remove the gown from the injured arm last. To put on the garment, reverse the proceedings, putting the sleeve on the injured arm first. To put on the sleeve, gather the wristband up towards the armhole in order that the entire sleeve may be slipped on with one movement.

In the case of helpless patients it is advisable to have the garment slit up the back as far as the yoke, or even completely slit up. When a properly made open-backed gown is not procurable, slit up an old garment, and finish it off neatly with strings at the neck. It must not be pinned. In many cases slitting up the gown is needless and should not be done unnecessarily.

First.—Sponge the patient's face, then dry it; wash the neck and ears, using a good lather; rinse and dry well. The ears need particular care.

Second.—Bring each arm out in turn over the washing blanket, wash the arm, and after placing the basin on the bed, wash and rinse the hand in the water; dry and proceed with the other arm.

Third.—Wash the chest and abdomen; this may be done under the blanket if desired, by holding up the blanket with the left hand whilst washing with the right hand. Particular care is required for the axillae, the umbilicus, and in stout women the folds beneath the breasts.

Fourth.—(The second washing flannel is now used.) Wash the genitals carefully under cover. In many cases the patients may do this for themselves, the nurse handing the things as required. With helpless patients it must not be neglected from a false sense of delicacy. Absolute cleanliness of these parts is of the utmost importance, as the skin easily becomes inflamed and irritated from the natural secretions unless kept scrupulously clean. The fold of the groins needs particular care. Should there be difficulty in cleansing (as during menstruation, p. 686), or when there is any irritation or discharge, these parts may be left until last, then place the patient on a bidet or suitable bedpan and give a local bath, using plenty of soap and hot water. The labia are *gently* swabbed with weak lysol, allowing the lotion to run down over the parts into the bidet; dry swabs are then used and finally the genitals are carefully dried with a towel. The addition of lysol, or ammonia, to the water is very cleansing and refreshing.

Fifth.—Change the water, using fresh hot water from the can. Expose the lower limbs in turn, and wash in the same way as the arms. The feet should not be placed in the basin if the patient is restless or unconscious. The nails must be trimmed if necessary and should in any case be scrubbed with a nail brush. When cutting the nails, do not attempt to cut the nail in one piece; this is often painful if the scissors are not sharp and the patient is sensitive. Cut the nails in small pieces leaving the edge smooth and even.

Sixth.—Turn the patient on to one side, wash and dry the back, starting with the shoulders. Rub the skin over the shoulders, sacrum, and hips, if necessary, with spirit, then rub on powder (p. 16). Particular care is needed in the fold between the buttocks. The washing blanket and mackintosh are next rolled towards the patient, who is then turned on to his back. Remove the mackintosh and washing blanket. When it is inadvisable to turn the patient, his back must be washed whilst a second nurse or assistant raises him. If it is advisable to move him as little as possible, the draw sheet and lower sheet may be attended to when the washing blanket is withdrawn.

Seventh.—Remove the upper washing blanket and cover the patient with a dry blanket.

Eighth.—Place the cape under the patient's head and proceed first to brush and then comb out the hair. When necessary, a small tooth comb must be used. In the case of 'dirty heads' (p. 423) the comb should be placed in carbolic (1–20) or other suitable antiseptic lotion (p. 425). In these cases the comb must be inspected and cleansed each time it is drawn through the hair, by wiping it with a piece of wool or linen soaked in the lotion. The hair of helpless women should be plaited in two plaits and tied at the ends. The plaits may be taken across the top of the head and fastened above either ear; this is more comfortable as it prevents the plaits getting under the shoulders; it is also very becoming. Remove the cape when finished.

Ninth.—Dress the patient in a warmed shirt or gown. It is desirable and more hygienic to have two gowns in use for bedridden cases, one being used for night, the other for the day; this gives time for airing. Make the patient's bed (p. 20) and leave him comfortable.

To Wash a Woman's Head in Bed (Fig. 1).—*Requisites.*—Washing blanket; two mackintoshes; towels; soap solution; small porringer; washing basin; small bath; can of hot water.

Method.—Remove the patient's gown and place a washing blanket around the shoulders, securing it with a pin in front under the chin; turn down the bedclothes to the waist. Place the patient with her head resting on the edge of the bed. Put a large mackintosh under her head over the washing blanket, having rolled one end of the mackintosh to form a trough and so prevent the water from running into the bed. Allow the other end of the mackintosh to hang over the side of the bed into the bath placed underneath. Give the patient a towel to cover her eyes. Have the washing basin on a chair protected with a mackintosh in a line with the patient's head. Put the hair into the basin, which must not be more than half full of water, and wet the head by pouring water over it from the porringer. Lather the head and hair, using the soap solution or a teaspoonful of soap liniment; rub the scalp thoroughly, using the tips of the fingers (not the nails). Rinse the hair in the basin, then allow it to hang over the bath and pour warm water over it from the jug. Wring the hair and twist it in a dry towel; remove the mackintosh. The patient may now be comfortably arranged with her head on the washing blanket. Rub the hair and head until most of the moisture has been removed, then comb out the hair. Remove the blanket, clothe the patient,

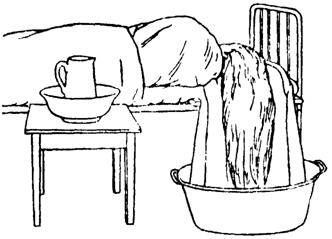


FIG. 1. Method of arranging a patient for head washing, lateral position.

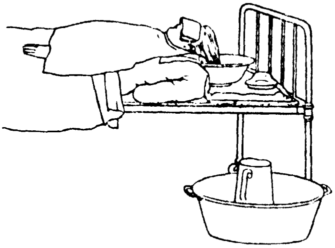


FIG. 2. Method of arranging a patient for head washing, dorsal position.

and arrange the hair over a rubber hot-water bottle (p. 29) until dry, then brush, comb, and plait the hair. Electric dryers may be used when the hair is very thick and long. The water used for washing should be as hot as can be comfortably borne by the patient.

When the patient may not be removed to the side of the bed proceed as follows: Remove the pillows, draw the mattress down one yard, or fold it under (Fig. 2). Place the patient's head over the folded end of the mattress after removing the gown; arrange a washing blanket around the shoulders and fasten with a pin in front; next arrange a large mackintosh over the blanket, securing it in front and allowing it to spread over the folded mattress so that the exposed wire mattress is covered. Place the washing basin on the mackintosh on the wire mattress and proceed as already described. For the second rinsing, empty the basin into the bath, place the hair in the basin, and gently pour on the water out of the can. Remove basin and mackintosh, and replace the mattress. This method entails no lifting or moving of the patient, and allows of thorough cleansing of the head.

The Care of the Mouth.—When the patient is able to do so, he should brush his teeth morning and evening, using some antiseptic tooth preparation; this may be conveniently done before the blanket bath. If unable to do this, his mouth must receive the most careful attention from the nurse.

To cleanse the mouth. Requisites.—A small gallipot containing sufficient mouth wash for cleansing; half a dozen prepared sticks, or mouth mops; tumbler containing an antiseptic mouth wash; tooth brush; porringer. To prepare the mops, roll a thin piece of absorbent wool firmly round the end of the stick, taking care that the point is well covered, or sinus forceps may be prepared with wool and used.

Method.—Remove any false teeth. Give the patient the mouth wash which may be either hot or cold as desired; after the mouth has been rinsed out, cleanse the teeth with the tooth brush, and finally instruct him to rinse the mouth again. Dip the mop in the mouth wash and swab all round the teeth and gums; with a clean one cleanse the palate, tongue, and cheeks. Continue until the mouth is rendered as clean as possible. Finally allow the patient to rinse his mouth with the mouth wash. If the patient is unable to use a mouth wash, the mouth is cleansed as described, omitting the brushing of the teeth and the rinsing of the mouth. Any false teeth should be thoroughly brushed with a tooth brush in cold water, and then in an antiseptic solution. In every case the mouth should be cleansed at least twice a day; in acute illnesses before and after all food; in abdominal cases, whether medical or surgical, four times a day or oftener.

A coated tongue may sometimes be cleansed by giving the patient dry toast to chew and instructing him to spit it out instead of swallowing it. (Infant's mouth see p. 699.)

For swabbing, the following are useful: Glycerine and boracic, boroglyceride, glycothymoline, Sanitas (1–20) with glycerine; peroxide of hydrogen may be used when the mouth is very offensive.

Mouth washes.—Glycothymoline, Euthymol, Dettolin, chlorate of potash, Sanitas, alum, chlorinated soda, soda water, Condy's fluid, eau-de-Cologne with water.

To quench thirst, swab the mouth out with glycerine and lemon juice, and give soda water into which a few drops of lemon have been squeezed, or plain soda water as a mouth wash. *Sordes* may be prevented by frequent cleansing of the mouth, leaving it wet with either boroglyceride, glycerine, and glycothymoline, or glycerine and borax. (For the relief of thirst see also saline injections, p. 58.)

The Care of the Back.—*Prevention and treatment of bedsores. Causes.*—Bedsores may be classed under two headings: those caused by an abrasion of the outer skin, and those caused by restricted circulation of the part.

An abrasion may be produced by chafing of the skin causing either roughness, or spots due to excessive moisture or excessive dryness, brought about by insufficient drying of the skin, or injuring the skin by the use of a roughened enamel bedpan, or lying on crumbs, etc. Restricted circulation is caused by pressure. This may be caused by the weight of the body alone if left in one position for a prolonged period; or bruising the parts by the clumsy insertion of the bedpan; or leaving the bedpan in position for too long a time.

Predisposing causes are debility, emaciation, paralysis (p. 361), and toxaemia (p. 577).

Prevention of bedsores is of the utmost importance in every case confined to bed. Prevention consists in maintaining absolute cleanliness, avoiding prolonged pressure, and stimulating the circulation of the part. The parts most liable to pressure are the lower part of the back over the sacrum, the prominences over the hips, the elbows and heels, the inner surfaces of the knees and ankles, and the back of the head. Parts susceptible to sores caused by moisture are the fold of the buttocks, the fold of the groins, and in stout women the folds beneath the breasts.

Cleanliness.—The back and other parts subject to pressure should be washed twice a day at least; patients suffering from incontinence should have the back attended to each time they require attention. After washing the lower part of the back the nurse should soap her hand well, and apply the soap to the back by rubbing with her hand until it becomes absorbed, leaving the skin dry. Next pour surgical spirit (methylated) into the hand and rub into the skin, using a circular movement until the skin is dry and pink. Lastly, having powdered the hand, rub it over the back. The fold of the buttocks needs special care, and careful drying is most important; many sore backs are caused by neglect in this matter. Dry skins should be rubbed with equal quantities of methylated spirit and oil as this prevents cracking; in some other cases methylated spirit is not suitable and should be replaced by either zinc and castor oil ointment or boracic ointment, rubbed in with the hand and followed by powder as when using spirit. Equal quantities of oxide of zinc, boracic, and starch powder make the most reliable dusting powder.

Avoidance of pressure.—This is best arranged for by moving the patient every two to four hours and rubbing the parts exposed to pressure with spirit and powder; by care in giving the bedpan, protecting the back with a pad if necessary and not leaving it in position one minute longer than necessary; by the use of solid rubber or air pillows, and the careful use of ring pads and small cushions. A hammock is useful in some cases. The drawsheet should be drawn through at least three times a day.

Stimulating the circulation.—This is effected by means of friction and the application of heat to the part. It cannot be too greatly emphasized that rubbing is of paramount importance in the care of the back, as without it the circulation is not restored and, therefore, the good effect of other applications is lost. The friction should be gently performed with the palm of the hand and should be continued until the part is pink and warm.

Bedsores.—*Symptoms.*—Sensation of heat, aching, discomfort, redness of the skin, if over a prominence, or small papule, or a bruise, or a crack in the folds of skin. If neglected, in a few hours' time the skin breaks and a shallow sore with a moist surface surrounded by healthy flesh is produced. This is a mild type of bedsore and rapidly heals if carefully attended to.

Treatment.—Relieve the pressure, attend to the back every four hours as already described; in slight cases no dressing is required. Omit using spirit over the sore, but apply an antiseptic powder liberally when it will quickly dry and heal. In more severe cases, apply an ointment dressing (p. 441) cut to the size of the wound, cover with sterilized gauze or lint, and keep in position by means of strapping; or instead of strapping, a gauze veil and collodion may be used (p. 441). To remove the collodion use acetone. The wound must be kept surgically clean and dry. The following applications may be used when a soothing application is needed: zinc and castor oil ointment; friar's balsam and castor oil; if stimulation is required, either zinc ointment and peruvian balsam or red lotion are recommended.

If the sore is progressing favourably, the surface will be red, clean, and dry with new granulations in the form of bright red specks, and healing will be taking place from the edges. (See healing by granulation, p. 518.) If the wound becomes infected, there will be local inflammation and discharge, the granulations are pale and unhealthy, and the sore grows rapidly deeper instead of healing. *Treatment.*—Cleanse with an antiseptic solution, either perchloride of mercury (1–2000) or carbolic (1–40); in very septic cases peroxide of hydrogen should be used before the lotion. The wound is lightly packed with gauze wrung out of the antiseptic solution and covered with wool. If stimulation is required the packing may be soaked in red lotion, or the wound may be touched with nitrate of silver. Sometimes the bedsore starts with small vesicles; these should not be broken unless they become pustules. The treatment is that given under prevention.

The second variety of bedsore is that known as an acute bedsore (see p. 363). Caused by pressure, it starts as a small bruise, and most commonly occurs over the coccyx. Once the bruise appears it is extremely difficult to prevent a bedsore developing. *Treatment.*—Relief of pressure, gentle rubbing to restore the circulation, and the application of heat to the part, by means of a rubber hot-water bottle, or fomentations, or hot bathing. The application of paraffin wax (p. 98) or tincture of iodine may be successful.

Usually a slough (p. 518) has already formed, which gradually becomes decomposed and eventually separates. Heat hastens the separation of the slough; the sore continues to enlarge and deepen until this occurs. It may progress with alarming rapidity, the sacrum becoming necrosed, the bedsore being of the size of a small plate, or larger. Heat in the form of carbolic (1–60) fomentations or charcoal poultices (p. 92) may be used until the slough separates; after which the sore is syringed and dressed with gauze and treated as a surgical wound (p. 438). There may be many discharging sinuses underneath the slough. Death may occur from toxaemia and exhaustion.

Occlusive dressing with Elastoplast.—Cleanse the surrounding skin and dry carefully, using surgical spirit, then cover the bedsore with a single, or preferably double, layer of Elastoplast without any intervening dressing, and without *stretching the plaster.* If extensive in area apply Elastoplast in strips, taking care not to crease or leave any exposed space between the pieces. It is important the Elastoplast should not be stretched. The Elastoplast is left in position as long as it will adhere—usually in the early stages, when discharge is plentiful, 12 to 48 hours. It is then replaced by similar pieces of Elastoplast plaster, and this is repeated until healing is completed. On removal of the plaster no attempt should be made to cleanse the surface of the sore; it suffices to wipe away the discharge from the surrounding skin with cotton wool, cleanse with surgical spirit, and apply clean Elastoplast plaster.

As the discharge diminishes the dressing requires less frequent changing; it may safely be left undisturbed for 7 to 10 days. Prophylaxis is of great value, and in any case in which bedsores are expected (paralysis, incontinence, etc.) the pressure points should be protected with Elastoplast immediately.

Pressure Sores.—Splint sores and plaster of paris sores are caused by pressure. Hot-bottle ' burns ' may be caused by pressure. Strapping sores may be caused by creases in the strapping or pressure over a prominence. Splint and plaster of paris sores appear as bruises and develop sloughs unless the pressure is removed at once.

Treatment.—Relief of pressure, application of heat, dry aseptic dressing, or the wound may be packed with sulphanilamide powder.

Hot-bottle 'Burns' (p. 521) are of two varieties and may be caused either by the bottle being placed too near the patient when it is very hot, or by the pressure of the bottle against the patient's skin. In the latter case it may be caused by the bottle rolling over and resting against the patient, and may occur even though the bottle is only warm (for prevention see p. 29).

Hot-bottle burns have the appearance of burns and may or may not be blistered (p. 521). Sores caused by pressure of the bottle appear as a red bruise; the skin is unbroken. In either case a slough forms which enlarges and deepens until it separates. These sores are most troublesome to heal; they may take months, and eventually may require skin-grafting (p. 465).

Treatment.—Fomentations, either boracic or carbolic; or triple dye jelly (p. 99). When the slough separates, the wound is dressed with an antiseptic gauze dressing or an ointment dressing. The occurrence of any bedsore or pressure sore should be immediately reported to the medical attendant.

The Bedpan.—*Rules to be observed when giving a bedpan.*—Ensure privacy by means of screens or drawing bed-curtains. Warm and dry the bedpan, and take it to and from the bed covered with a clean washable cover; in infectious cases a lid and handle cap should be used in addition to the cloth cover (p. 10). Keep the cover solely for the use of the bedpan or urinal. Never leave the patient to insert or take out the bedpan. Remove the bedpan from the bed as soon as possible, and remove it from the sick-room immediately. Air the room after tucking up the patient.

To insert the bedpan.—Raise the patient's pelvis by placing the left hand beneath the back; with the right hand slide the bedpan in position, taking care not to knock the back. Two nurses are necessary when inserting the bedpan after abdominal operations (p. 563) or in critical cases needing as little movement as possible. One nurse lifts the patient, the second nurse assisting with her left hand and using her right to place the bedpan in position.

Patients who are unable, or not allowed, to perform their toilet after the use of the bedpan must be attended to by the nurse quietly, deftly, thoroughly, and as much as a matter of course as any other part of the nursing. In ordinary cases, toilet paper may be used with subsequent washing, in others, tow with the use of warm water or lotion (Lysol); in surgical rectal cases (p. 497) absorbent wool should be used, the dressing being done afterwards; this is also necessary after many gynaecological operations (p. 563). A small bowl containing the warm water or lotion should be taken to the bedside when the bedpan is to be removed; and after using the lotion, the soiled tow or wool may be placed in the bowl instead of the bedpan, otherwise it requires removal with forceps before emptying the pan. If the patient may turn on his side this facilitates cleansing. The bedpan should be emptied immediately unless needed for inspection; cleanse by flushing with cold then hot water, using a disinfectant if necessary.

Urinals should be taken to and from the bed covered; they should be emptied and cleansed immediately.

Various bedpans may be had. Those most commonly used are the round bedpan with a handle, either porcelain or enamel; the *slipper*, which is useful for patients who should not be lifted more than necessary; the 'Perfection' bedpan (Fig. 3) is porcelain, made with a large opening and easily cleansed. This is useful in corpulent cases and also when it is necessary to use a bedpan for douching or bathing, or for cases inclined to bedsores, no pressure being experienced over the sacrum, as it is especially moulded to the shape. The *cradle* bedpan is another which is large and prevents any pressure. Urinals may be made of glass or porcelain; those of glass are the most satisfactory as they are more easily cleansed. They may be had for male or female patients. A glass jam jar makes a useful substitute for male urinal.

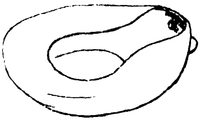


FIG. 3. The 'Perfection' bedpan.

Bedmaking.—*Requisites.*—A narrow bedstead with a wire spring mattress, a hair mattress if possible, otherwise a good flock one (the mattress should be covered with a well-fitting washable cover); two or more pillows, one of which should be feather; two sheets, either linen or cotton; a drawsheet made of double soft sheeting two yards long and one yard wide; blankets and pillowslips; a quilt which should be light and washable. Mackintoshes are necessary in the majority of cases, but should not be used unnecessarily; a short mackintosh is used under the drawsheet, and a long mackintosh to cover the mattress entirely is used beneath the bottom sheet in all cases in which the bottom sheet may become soiled. If old sheets are used for drawsheets, care must be taken that they are not seamed or patched or a bedsore may result.

To strip a bed.—When possible, bedmaking should be done by two persons. Place a chair one yard from the foot of the bedstead. Remove the pillows and untuck the bedclothes. Take off the bedclothes separately, folding the upper corners to the lower corners, lift and place them on the chair, one nurse putting down her half, the second nurse then folding her half over the first. When removing the bedclothes from the chair the uppermost half is taken up first, so unfolding the article. Having stripped the bed, brush the mattress, then fold it over from top to bottom, dust the bedstead, draw the folded mattress to the top of the bed, dust the lower half of the bedstead and unfold the mattress. When the patient is unable to leave the bed, the upper bedclothes are stripped, leaving the inside blanket or the sheet covering him.

To change the under-sheet when the patient is able to turn.—Strip the bed, remove the drawsheet and small mackintosh. Roll half the clean sheet lengthwise. Turn the patient on to his side, one nurse supporting him by the shoulders and hips. Roll the soiled under sheet towards the patient's back and, after dusting and straightening the long mackintosh, place the clean sheet on the bed with the rolled-up half against the roll of the soiled under sheet; straighten the remainder of the sheet over the mattress and tuck it in firmly and neatly. Roll half the mackintosh and sufficient clean drawsheet together and place the roll against the roll of the clean under-sheet; tuck in the drawsheet, rolling up the end and placing it evenly under the mattress. Turn the patient carefully on to the clean side of the bed and make the second half of the bed after removing the soiled under sheet.

When the patient is unable to turn.—After stripping the bed and removing the drawsheet and mackintosh, roll the clean sheet crossways. Roll down the soiled sheet towards the patient's shoulders, place the clean sheet in position, the rolled-up end against the roll of the soiled sheet. Tuck in the end firmly at the top, raise the patient's head and shoulders, each nurse placing one hand under either shoulder; with the free hand draw down the soiled sheet, dust out the mackintosh, roll down the clean sheet and place the patient down. The pelvis is then raised in the same way, and lastly the limbs. Tuck in the sheet at the bottom, then tighten and straighten the sheet by drawing it from either side and tuck it in. Finish the bed as usual.

When the under-sheet is not to be changed, remove the short mackintosh and drawsheet, dust the bed, then straighten and dust out the under-sheet and proceed as described.

In acute cases to be disturbed as little as possible, do not take out the mackintosh and drawsheet. The mackintosh is straightened and dusted out and the sheet is drawn through. Should a clean drawsheet be necessary, pin the end of the clean sheet to the edge of the soiled one, using safety-pins, and draw it through.

Rules to be observed when bedmaking.—Have everything at hand before commencing. Take care that the patient is not exposed to a draught; especial care is needed with patients suffering from nephritis (p. 241). *The patient's face or mouth must not be covered with a sheet or blanket.* Pillows should not be shaken over the bed.

Patients nursed in upright positions, i.e. Fowler's and heart positions (pp. 26, 27), should not be laid flat for bedmaking. One nurse should support the patient, unless the latter is able to sit up alone, whilst the pillows are removed for attending to the under-sheet.

Soiled linen should be placed in a soiled linen bin, or other suitable receptacle, at the bedside. When nothing of this nature is provided, fold the sheets, avoiding shaking and handling them as much as possible, and place in a dust sheet laid on the floor.

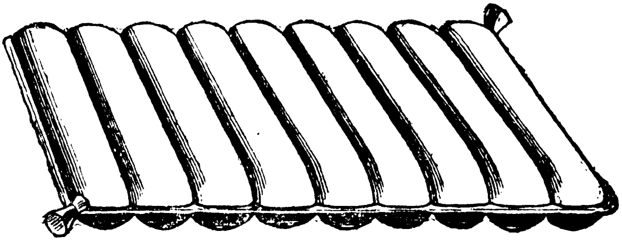


FIG. 4. Water or air bed.

When lifting the patient's head the nurse's hand should not be placed before the patient's face.

When changing the lower sheet, half the bed should be well cleaned before putting on the clean sheet; when the lower sheet is not changed, it should be thoroughly dusted out with a clean duster or cloth.

To prepare a Water or Air Bed (Fig. 4).—Cover the wire mattress with fracture boards; next place the ordinary mattress in position, cover it with a long mackintosh sheet, and over this a single fold of old blanket, to prevent the two rubber surfaces coming into contact, which spoils rubber, and on top of the blanket place the rubber mattress to be filled with either water or air. If water is used it should be at a temperature of 100° F.; it may be run in with a hose, or a funnel and cans of water may be used; if air is needed it is pumped in with either a bellows or an air pump. The bed should be filled until it is sufficiently inflated to prevent the lower mattress being felt when both arms are simultaneously pressed heavily on the rubber bed. The bed is then made in the usual way, or an old blanket may be placed over the rubber mattress, tightly tucked in, and covered with the bottom sheet; this keeps the bed warm and does away with the uncomfortable clammy moisture produced by rubber, and is thereby a preventative of bedsores (p. 17).

Water or air pillows are usually about half the size of a full bed, and are most useful for cases nursed in the Fowler position (Fig. 8), the semi-recumbent position, or cases in which the back is liable to bedsores.

To prepare a water pillow.—Place two fracture boards under the middle of the ordinary mattress. Make the bed as usual, using a long mackintosh, as far as the mackintosh under the drawsheet, which is covered with a single fold of old blanket the same size. Place the water pillow on the blanket and fill as described for water bed. Cover the water pillow with an old blanket the same width as the drawsheet, tuck it in firmly, then cover it with the drawsheet. The pillow may be covered with the drawsheet, omitting the blanket if preferred. Raise the foot of the bedstead on blocks, as this keeps the pillow in better position. Two pillows may be necessary to raise the patient's legs to the same level as the pillow and so prevent them swelling. Finish the bed as usual.

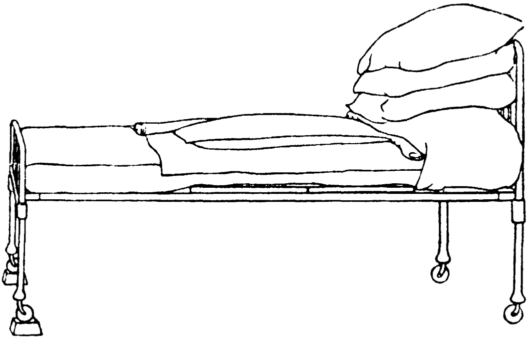


FIG. 5. Method of making up a bed with a half-size water pillow.

Solid sponge rubber mattress and cushions are soft, elastic, comfortable, and ready for use without filling with either air or water. They are a recent improvement on both water and air beds. Two well-known makes are 'Dunlopillo' and 'Sorbo.' They are much lighter to handle than the water bed and cannot lose their resilience through deflation by punctures.

Rubber ring cushions inflated with either air or water may be used to relieve pressure locally; they must not be filled too full, and if a cover is used it should be made to fit tightly and smoothly to prevent wrinkles.

Divided Mattress.—This consists of a firm, thick hair mattress divided crossways into three pieces. Two of these pieces are of equal length and fit over the upper and lower parts of the bedstead, the middle portion being shorter and subdivided lengthways in two.

To prepare a bed with a divided mattress (Plate II C).—Cover the wire mattress with fracture boards, then place the divided mattress in position, care being taken that the middle pieces are correctly placed or they will not fit accurately. Cover the upper and lower portions with a mackintosh and a small sheet or drawsheet, leaving the middle portions uncovered. Over the middle portions place a small mackintosh covered with a drawsheet in the usual way. Finish the bed as usual. The object of the divisions is that the patient may have the bedpan inserted and the back attended to without being raised at all. To insert the bedpan, untuck the drawsheet and withdraw half the middle portion of mattress under the injured side for an inch or two; from the opposite side withdraw the second middle portion; place the bedpan in position and replace the portion of mattress as far as it will go, or it may be omitted until the bedpan is removed. This mattress is invaluable in the treatment of a fractured pelvis (p. 541), fractured femur (p. 539), and cases of incontinence. In the latter cases a bedpan covered with a rubber ring cushion may be left in position, or a rubber bedpan may be used. When this mattress is in use one nurse only is required to attend to the patient.

To prepare an Operation Bed (Plate II B).—Thoroughly brush the mattress and carbolize the bedstead, using a mop and carbolic (1–20) for the purpose. Make the bed as usual as far as the drawsheet, using clean linen and a small mackintosh in every case; a long mackintosh is used if necessary. Next make the bed with the upper bedclothes, turning the blankets up at the bottom as at the top, and omitting to tuck the bedclothes in at the sides. Turn the sheet over the quilt as usual at the top, then fold the hanging bedclothes from one side over the quilt, taking all the bedclothes together, fold over the bedclothes from the opposite side, then the bottom to the middle, and lastly the top to the middle; this leaves a neat packet of bedclothes. Cover the pillow with a jaconet cover under the clean linen cover if necessary, and place it on the chair at the bedside. Pin down a carbolized piece of jaconet covered with a clean towel over the portion of the bed where the dressing will rest, taking care not to insert the pins through any underlying mackintosh. Prepare and place in readiness any appliances required, such as cradle, sand-bags, etc., and draw the bedstead down a yard from the wall at the head. Fill two hot-water bottles with boiling water, cover them securely, and place them on the drawsheet, covering them with the folded packet of bedclothes (Plate II). Put a blanket by the fire or on a radiator to warm. As the patient returns, lift the packet of bedclothes on to a chair and remove the hot bottles; lift the patient on to the bed and cover with the warmed blanket; remove the stretcher and place the necessary appliances (if any) in position; put the hot-water bottles in a suitable and safe position (see hot bottles, p. 29), then lift the packet of bedclothes on to the patient; unfold the upper part over the patient's chest, the lower to the bottom of the bed, the sides to either side, and tuck them in.

The above way of preparing the bed has the following advantages. The bed and bedclothes are all warmed, a most important point in all conditions of shock; a warmed bed and bedclothes imparts more warmth to the body than isolated hot bottles, and is, therefore, much more efficient in counteracting shock (p. 561). Moreover, the bedclothes are easily, quickly, and comfortably arranged without remaking the bed when cradles or other appliances are required. There is no hindrance in lifting the patient on to the bed and removing the stretcher as there are no rolled-up bedclothes in the way. To prevent getting the bedclothes upside down always fold over the top of the bedclothes last and unfold it first.

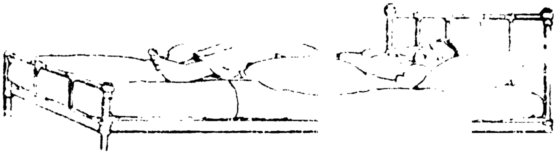


FIG. 6. The abdominal recumbent position.

Accident, or 'New Case' Bed.—For receiving stretcher cases, the bed is made up as an operation bed, spreading a long mackintosh and washing blanket over the under-sheet to prevent soiling the bed linen until the patient is undressed and washed.

Leg Bed.—This mode of making the bed is useful in cases where the feet and legs require examination or treatment. Make the bed as usual as far as the top sheet. Place the sheet in position, but do not tuck it in; leave the end hanging over the bedstead, put on the blankets, turning up the lower end level with the edge of the mattress, then fold the bottom end of the sheet over the folded blankets and tuck in the sides. Finish the bed as usual.

Positions.—*Recumbent.*—The patient is placed flat in bed, one pillow under the head.

Semi-recumbent.—The patient is half propped up with several pillows or reclining bedrest.

Abdominal recumbent.—The patient lies flat in bed, one or two pillows being allowed under the head, the knees are flexed over a bolster (Fig. 6).

Lateral.—The patient is turned on to the side, one or two pillows are allowed under the head, and several pillows may be placed at his back to prevent him rolling backwards.

Prone or ventricumbent.—The patient is placed flat on his face, and one pillow is allowed under the head which should be turned to one side. The feet should be raised on a pillow to prevent the toes pressing on the bed (Fig. 7).

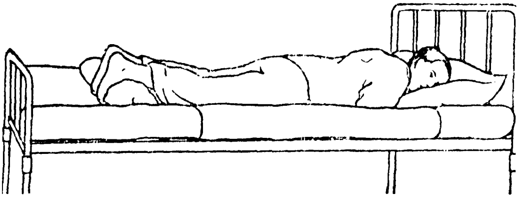


FIG. 7. The prone, or ventricumbent, position.

Fowler's position.—The patient is propped upright in a sitting posture by means of pillows. A bedrest may be used, but it must be upright, not reclining. The knees are flexed over a bolster (Fig. 8). A water pillow or solid rubber cushion (p. 23) or air ring should be used when possible as it adds greatly to the patient's comfort. To retain the bolster in position, tie the ends up to the head of the bed by passing loops of strong calico bandage round each end and fastening it to the head of the bed. Another way is to wrap the bolster in a drawsheet and tuck the ends under the mattress. Some surgeons will not allow a knee pillow or bolster to be used on account of the tendency to produce thrombosis (p. 281) if left in position too long or fastened too tightly. In these cases a footrest placed at the bottom of the bed prevents the

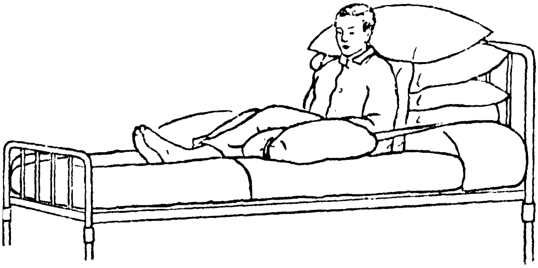


FIG. 8. The Fowler position.

patient slipping. An efficient and comfortable alternative to a knee bolster which cannot cause restriction of movement, or of the circulation, is to place a large rubber hot-water bottle, filled with *warm* water, under the patient's thighs.

Upright position in heart cases (Fig. 9).—Place the patient in a sitting posture on a water pillow, and prop up with a bedrest and pillows, arranging pillows for the arms to rest on. For cases requiring to lean forward arrange a bed table in front of the patient, and cover it with a pillow; it should be of such a height that the arms may rest comfortably on it. Heart tables (Fig. 10) may be had. They are made to fit across the bed and can be adjusted to any height; an adjustable headrest is also provided.

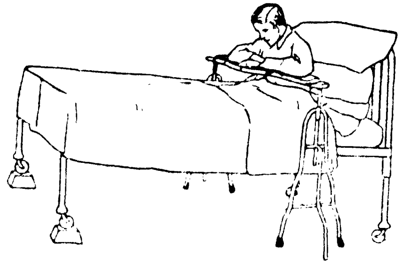


FIG. 9. The upright, heart position.

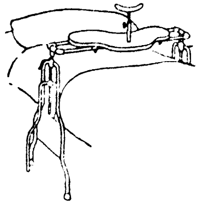


FIG. 10. Heart table with adjustable headrest in position across a bed.

Pillows used for propping up should be of horsehair and very firm; two feather pillows are needed in addition, one for the head and one to place lengthways down the back. A comfortable way to arrange pillows for the semi-recumbent position is to place them lengthways, sloping from the head of the bed to the side; one is placed crossways for the head (Fig. 11).

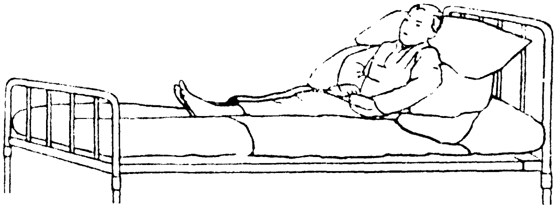


FIG. 11. Semi-recumbent position showing method of arranging the pillows crosswise.

The head of the bed is raised on blocks when it is desirable to have the patient's pelvis lower than the head and when it is not advisable to use the Fowler position. The foot of the bed is raised on blocks when it is necessary to have the upper part of the body lower than the pelvis or legs.

Blocks may vary in height from 4 inches to 18 inches. Substitutes for blocks are: books, 1-lb. treacle tins filled with gravel, and for high blocks, kitchen chairs; when chairs are used the leg of the bed must be firmly tied in position to prevent slipping.

Lifting a Patient.—Lifting, raising, and turning a patient is more a matter of skill and knack than of actual strength; constant practice only will enable the nurse to become a good lifter. Two nurses are necessary in the majority of cases.

Points to bear in mind when lifting a patient are: Loosen the bedclothes, knee bolster, etc. and replace any pillows that have slipped, in order that movements may not be impeded. Bend from the knees and hips, not the back. Avoid jerking, pulling, and all ineffectual movements. Lift together. Use the whole hand and not the fingers alone. When holding the patient, take a firm hold but not roughly, so that the patient has a feeling of being securely supported, otherwise he will endeavour to assist, or will feel strained and uncomfortable.

To lift a patient when in the Fowler or propped-up position.—A nurse stands on either side of the bed. Instruct the patient to fold the arms across the chest. Each nurse places a hand under the patient's shoulders about the middle of the back; the hands are then firmly clasped; the other hand is placed below the patient's buttocks and clasped. Lift together fairly quickly, but not jerkily.

To raise off the bed when recumbent. — Each nurse places one hand under the shoulders and one under the pelvis, clasp hands and lift together. One nurse may lift the patient for drawing the sheet in this way if the case is one that permits and the lifting is not required for long. If the patient may help a little he should be instructed to hold the top of the bed or bed pulley and press the heels on the bed, otherwise he should fold his arms across his chest. In cases in which it is necessary to raise the patient for some time a pelvic rest should be inserted under the pelvis (see Fig. 102).

To raise from the recumbent to the sitting position.—One nurse is usually sufficient. Stand on the right of the patient. Place the left arm beneath the patient's shoulders, pass the right arm under the patient's right axilla, and draw him upwards and forwards, using both arms. If the patient may assist, direct him to pass his right arm under the nurse's right, placing his hand at the back of her shoulder.

To turn a patient.—Stand at the side to which it is desired to turn the patient. Reach across the patient and place one hand below the shoulders, the other under the pelvis as far as possible.

Draw the patient towards you. One nurse is sufficient for this except in spinal cases, when two nurses should turn the patient, great care being taken that the head, shoulders, and pelvis are kept in line (*en bloc*), so that the spine is not twisted. One nurse should support the head and shoulders, the second nurse supporting the pelvis and thighs. In cases in which it is desirable to disturb the patient as little as possible the lifting may be done by using the drawsheet instead of placing the hands on the patient. To turn a patient by means of a drawsheet, untuck the sheet on the opposite side, roll it as far as the patient, then standing on the other side, grasp the rolled sheet firmly and turn the patient by drawing the sheet towards you.

To raise the patient off the bed when recumbent. — Untuck and roll the drawsheet on either side as far as the patient. Lift by grasping the rolled portion of sheet.

To remove from one bed to another.—Bring the two beds close together sideways; remove the upper bedclothes from the spare bed, then draw the patient on to it by means of the under-sheet.

To lift a hip case.—See hip diseases, Chapter XIX, p. 618.

To fill and place Hot-water Bottles. — *Rubber bottles.* — Half fill the bottle, using a funnel, with water which has just ceased boiling, expel the air by compressing the upper half of the bottle and screw in the cork before relaxing hold. Place in a well-fitting thick flannel cover and fasten it securely, then turn it upside down to ensure there is no leakage.

Earthenware bottles.—Heat the bottle; fill three parts full with boiling water; screw in the cap securely, taking care to see that the washer is in position. Cover with a well-fitting thick flannel cover and fasten it securely.

Electric thermal pads and *blankets* are now available and ensure an immediate, continuous, and safe means of warming the patient. The pad is also most efficient for local application of dry heat. The heat may be regulated and very little electric current is consumed.

Points to remember when using hot bottles.—Serious burns and bruises with lasting and grave effects may result from carelessness in filling and placing a bottle, so much so that some doctors forbid the use of them. Hot bottles can be rendered absolutely safe with proper care; a burn or bruise resulting from their use is a disgrace to the nurse in charge and quite preventable (for treatment see p. 19). Fill the bottles as described above, taking care to inspect the washers and stoppers each time. Place in the bed, not near or touching the patient; the object in using hot bottles being to raise the atmosphere around the patient's body, not to heat one particular limb or part. See that a fold of blanket intervenes between the patient and the bottle. If necessary, tether the bottle by means of a bandage tied from its handle to the bed frame to prevent it rolling out of place, or fix it behind a sand bag. Remember that bottles may cause so-called 'burns' when nearly cold if they roll over and press on the skin. For children and unconscious patients place the bottle in a wicker protector and tether as already described; there need then be no fear of a burn or a bruise.

To apply heat in cases of collapse.—Cover the patient with a really hot blanket, and give a hot drink if permissible. If possible use an electric thermal pad, or blanket, place the patient on a warm (not hot) water pillow. Place hot bottles around as already described, using three on either side of the bed. An abdominal cradle may be placed over the blanket having two or three rubber bottles securely attached to it. A radiant-heat cradle may be used, or warm air may be introduced by means of the radiant heat cradle (p. 112), but the temperature should not be raised above 120° F. Electric lamps are sometimes recommended, but are not safe as they become too hot. Friction with hot rough towels is possible in a few cases. For children a hot mustard bath is an excellent preliminary restorative (p. 117).

The Use of the Feeding Cup.—These are of two varieties—those made with a lip, suitable for patients who are not lying flat in bed and who are not helpless; and those with a spout for the use of helpless patients lying flat. When feeding a helpless patient with a spouted feeder, teach him how to use the tip of the tongue for closing the spout when he wishes to pause to take breath, etc. Place the spout well between the lips and tilt up the feeder, otherwise the patient is only able to get a few drops at a time, which is irritating and annoying.

Always place a serviette or tray cloth beneath the patient's chin before feeding and wipe the mouth afterwards. To allow any of the fluid to trickle outside the mouth is an evidence of incompetency on the part of the nurse.

Special care is needed in the cleansing of feeding cups. They must be washed immediately after use in hot water and soda, rinsed in clean water, and dried. Spouted feeders must have the spouts cleansed with a small bottle brush.

When using a feeder with a rubber tube attached (p. 55), detach the tube for washing and boil it at least once a day, keeping it in boracic lotion when not in use. Patients using a tube on a feeder should be told to compress the tube between the teeth when needing a rest.

Reservation of Specimens.—*For the laboratory.*—See p. 121.

For inspection.—Receive the specimen into an absolutely clean vessel; cover either with a lid fitting the vessel, or a cloth or piece of jaconet soaked in carbolic (1–20). Place the specimen in the test room if in hospital, in the bathroom or some other suitable place if in a private house. When the physician is ready to inspect, substitute a clean glass cover for the lid or cloth. An ordinary square of glass will suffice for the glass cover. Faeces may be left in the bedpan or emptied into a glass inspection bowl with as little disturbance as possible. Toilet paper must be previously removed. Whilst awaiting inspection the bedpan or bowl must be covered with its own lid and over that a bedpan cover wrung out of carbolic (1–20); it should be kept in the lavatory as near a window as possible until needed. In hospital proper open-air cupboards are usually provided for this purpose. Vomit is left in the porringer, suitably covered, or emptied into an inspection bowl. Urine, tapping fluid, etc. is put into specimen glasses. Sputum is left in the sputum cup. Discharges—the dressings on which these have been received are placed in a dressing bowl or inspection bowl. Pads, diapers, etc. required for inspection are labelled, folded in a convenient manner exposing the discharge to view, and placed on a tray covered with glass, or placed in an inspection bowl.

To give and collect a Test Meal.—Pathologists vary in the food they like given for a test meal and also as to the length of time allowed for its digestion. The following is a common test meal (the meal is given on an empty stomach first thing in the morning, nothing having been taken since the previous evening at 8 p.m., except a charcoal biscuit at 9.30 p.m.): Four ounces of dry bread toasted, or one roll, dry; half a pint of weak tea without milk or sugar. The meal is removed at the end of one hour.

To collect the test meal.—*Requisites.*—As for stomach wash out, omitting water (p. 64). Pass the tube into the stomach, lower the tube below the bed over a sterilized porringer standing in a large bowl, allow the contents of the stomach to flow into the porringer. Cover the porringer with a lid, label it, and send to laboratory. The label should be inscribed with the patient's name, the date, nature of meal given, length of time left in the stomach, and whether any water has been added in its removal.

Should there be difficulty in syphoning back the contents of the stomach Senorans' stomach aspirator (Fig. 12) may be employed, or if this is not available one or two ounces of sterile water may be used to start the return flow.

Fractional Test.—*Preparation.*—The previous evening at 7 p.m. the patient is given a light meal of carbohydrate nature—toast and butter with cocoa or milk to drink. Two hours later he has one or two charcoal biscuits with a glass of water, and after this nothing is allowed either to eat or drink until the test is made the following morning.

Requisites.—Dressing mackintosh and towel. Either a Ryles or Einhorn stomach tube in a bowl of warm sterile water, 20 c.c. glass serum syringe (Record), sterile, clamp, strapping, scissors, sputum cup. Thirteen sterile test tubes labelled and corked. Two sterile glass flasks, one labelled 'resting juice,' the other 'residual fluid.'

The test meal is prepared as follows. Add two tablespoonfuls of fine oatmeal to one quart of water, boil slowly until reduced to one pint. Flavour with salt and strain through muslin. Given warm.

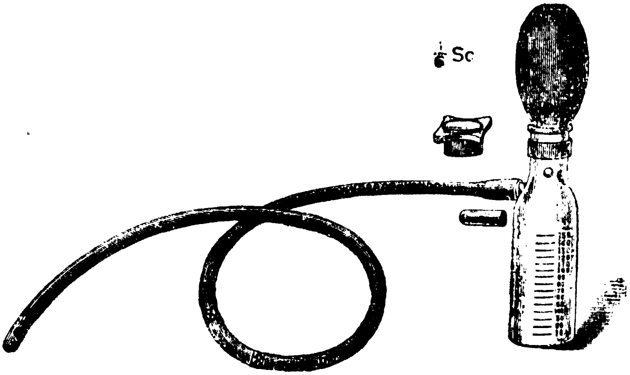


FIG. 12. Gastric Juice Aspirator.

Method.—The bulbous end of the stomach tube is placed in the patient's mouth at the side of the tongue and he is directed to swallow it, this is easily done if the tube is moist. On the Ryles tube the mark on the tube when level with the teeth indicates the bulb of the tube is in the stomach: the Einhorn tube is marked with three rings which, when opposite the incisor teeth indicate the bulbous end has reached the cardiac orifice, fundus of stomach, and pylorus respectively. Saliva should be expectorated not swallowed (see p. 123), retching if present is relieved by breathing deeply through the nose. The syringe is then attached to the oral end of the tube, and the contents of the fasting stomach are withdrawn and placed in the flask marked 'resting juice,' and the flask corked. The stomach tube is clamped and anchored by the clamp with strapping to the patient's cheek to prevent it slipping down into the stomach. The patient is now given the gruel to drink. A specimen of about 10 c.c. is withdrawn after unclamping the tube every 15 minutes until 8 or 10 specimens have been obtained or until no more fluid is available, the tube being clamped and anchored after the removal of each specimen. As each specimen is obtained it is emptied into the sterile tube which is corked and numbered. If after 10 specimens have been withdrawn the stomach is not empty, the remaining fluid is withdrawn in the same way and emptied into the flask marked 'residual fluid.' The test tubes and flasks properly labelled and securely corked are sent to the laboratory.

Observations which can be made at the time are: whether the fluid is clear or whether some specimens contain bile, blood, or charcoal, the odour—a very offensive odour is usual with a dilated stomach which never really empties itself.

Analysis of the contents.—Each fraction is examined for:

1. Mucus—excess in all specimens denotes gastritis.

2. Bile—present in all specimens when an anastomizing operation has been performed.

3. Blood—present in all specimens indicates a large ulcer or carcinoma.

4. Starch—its rate of disappearance shows the emptying time of the stomach, normally it disappears in 1½ to 2 hours.

5. Lactic acid—excess used to be regarded as suggestive of carcinoma.

6. Free acidity—is high in duodenal ulcer, often normal in gastric ulcer, often low in gall bladder lesions, and reduced or absent in carcinoma, pernicious anaemia, and old age.

7. Total acidity, total chlorides.

8. The amount of 'resting juice,' which is normally 60–120 c.c.

9. The amount of 'residual fluid.'

10. Any charcoal present. The charcoal should have passed during the night, and its presence denotes delay in the activity of the stomach.

Lyons's non-surgical drainage of the Gall Bladder is a method used to induce the gall bladder to empty its contents, and thus drain itself without surgical interference. It is carried out by the administration of a small dose of concentrated magnesium sulphate which is poured into the duodenum by means of a stomach tube, either an Einhorn or Ryles tube.

Preparation.—The patient is given a fat-free meal the previous evening—lean meat, brown bread, and stewed prunes—he is told not to swallow his saliva when he wakes in the morning, but to rinse his mouth out with a weak antiseptic mouth wash.

Requisites.—Einhorn or Ryles stomach tube, sterile, in a bowl of warm sterile water, glass serum syringe 20 c.c. (Record). Twelve sterile test tubes, glass flask for 'resting juice,' jug of sterile water *and glass funnel*, litmus paper, one pint of a 25 per cent solution of magnesium sulphate, towel, receiver for waste water.

Method.—The stomach tube is passed into the stomach and the 'resting juice' is withdrawn as described under fractional test meal, p. 32. The patient is then turned on his right side and the tube passed a little farther—beyond the third mark on the Einhorn tube—so that it may, if possible, enter the duodenum. Twenty c.c. of the prepared magnesium sulphate is then poured into the oral end of the tube by means of the serum syringe. Fifteen minutes later fluid is withdrawn at short intervals until a *yellow* specimen is obtained, this is labelled Specimen 1. This specimen is tested with litmus paper, and *if acid*, the end of the tube is considered to be in the stomach, not in the duodenum. The funnel is then attached to the oral end of the tube and water is poured into the stomach; this is done to stimulate peristalsis, and so cause the end of the tube to be carried through the pylorus into the duodenum. When possible, the patient should be examined with X-rays to make sure the tube is in the duodenum. Specimens are collected until an alkaline one is obtained which is labelled Specimen 2. When no more fluid is obtainable, 50 c.c. of the magnesium sulphate solution is poured down the tube. This causes the gall bladder to empty. After a few minutes interval specimens are again withdrawn until one of a golden brown colour is produced which is labelled Specimen 3.

Urine.—*To measure urine.*—Pour the urine into a graduated porringer, read off the ounces contained in the porringer, and note them on a slate or in a report book. Every 24 hours add together and chart the total.

To collect a 24-hours Specimen—from 8 a.m. to 8 a.m.—Have a large glass graduated jar with a lid, or a small enamelled pail with a lid on will do; see that it is absolutely clean. At 8 A.M. (start of 24 hours) direct the patient to pass urine, empty the urine away. Each time after this during the 24 hours all the urine passed by the patient is emptied into the glass jar. At 8 A.M. the following morning (end of 24 hours) direct the patient to empty the bladder, and add the urine passed to that in the glass jar. The specimen is now complete. Measure and stir the urine and put up two specimens in specimen glasses. Label with the patient's name, the total quantity of the 24-hours specimen, and the date.

In the case of female patients instruct them to pass urine before allowing the bowels to act, otherwise the specimen will be incomplete. Two bedpans should be used, removing the first as soon as urine has been passed.

Collecting a specimen of urine from an infant is sometimes attended with difficulty. With boys a specimen glass may be carefully arranged in position, with girls the child should be placed over a suitable receptable when being fed.

Urine Testing.—Note the colour, appearance, specific gravity, and reactions in all specimens to be tested, and proceed to test for any of the undermentioned abnormalities.

Specific Gravity.—This test is the means by which the density of the urine is ascertained. The solid substances in the urine give it a greater weight or density, i.e. higher specific gravity, than water. Specific gravity of water, 1000; specific gravity of normal cold urine, 1015–1025.

Method.—Place the urinometer in a specimen glass containing sufficient urine to enable it to float, allow it to become steady, then read the number on the urinometer to which the urine reaches; this is the specific gravity.

Reaction.—Dip one end of a strip of litmus paper in the urine and compare the colour with the dry paper. Applies also to vomit.

Result.—Blue paper turned red indicates acid urine; red paper turned blue, alkaline urine; no change in colour, neutral urine; red paper regaining colour when dry, ammoniacal urine.

To filter Urine.—Place a folded filter paper in a glass funnel over a clean specimen glass; pour on the urine and allow it to trickle through. Cloudy urine should always be filtered before being tested, except when testing for pus.

Excess of Phosphates.—*Appearance.*—Clear or cloudy, either neutral or alkaline, phosphates may not be discernible in cold urine.

Test.—Heat the urine in a test tube.

Result.—A cloud appears which clears on adding one or two drops of acetic acid.

Urates.—*Appearance.*—Clear when voided, becomes turbid on cooling, with a thick orange cloud and a pink deposit; acid reaction.

Test.—Heat the urine.

Result.—Clears on heating.

The Detection of Albumin (protein) in Urine.—*Appearance.*—May be clear or cloudy, pale or high coloured, acid or alkaline (p. 236).

1. *Test.*—If the urine is alkaline add 1 or 2 drops of dilute acetic acid. Fill a test tube three parts full with urine, boil the upper part over a spirit lamp, add one drop of nitric acid.

Result.—A white cloud or precipitate appears on heating which is unaffected or intensified by the addition of acid.

2. *Heller's Test.*—Pour ½ inch of nitric acid into a test tube, slant the tube, and with a pipette allow ½ inch of urine to flow down the side of the tube and to float on the surface of the acid.

Result.—A white ring at the junction of the liquids indicates albumin.

Fallacies.—Non-albuminous urine containing an excess of urea may produce a white cloud which, however, will disappear on heating. A brownish-red ring appearing at the junction of the fluids indicates that the urine is rich in urinary indigogens (toxins derived from putrefactive germs in the intestine) and has nothing to do with albumin (see indican, p. 237).

Quantitative estimation of albumin.—Esbach's albuminometer is required for this test; it consists of a thick glass tube graduated from 0–7 and marked with the letters U and R.

Test.—Note the specific gravity of the urine. If the specific gravity is 1010 or more, dilute the urine sufficiently with water to bring the specific gravity to 1008; this is important and is often overlooked. Filter the urine if cloudy, and if alkaline add one or two drops of acetic acid. Fill the tube with the urine up to the letter U, then add Esbach's solution up to the letter R. Close the tube with the rubber stopper and gently invert it a few times to allow the fluids to mix. Set aside for 24 hours in an even temperature. The height of the precipitate is then read off from the scale. The graduations are in parts of 1000, so that dividing by 10 gives the percentage of albumin, or multiplying by 4·375 gives the quantity in grains per ounce. If the urine has been diluted, the result must be multiplied by the degree of dilution. If after the first trial the level of the precipitate is found to be above the mark 4, the urine must be diluted and a fresh estimation made.

The Detection of Sugar in Urine.—*Appearance.*—Urine pale, clear, and of high specific gravity (p. 35).

1. *Fehling's test.*—Take ½ inch of Fehling's solution in a test tube and boil; take an equal quantity of urine in a second tube and boil it; add the urine gradually to the solution and boil after each addition.

Result.—A yellow or orange-red precipitate indicates sugar.

2. *Benedict's qualitative test for sugar (glucose).*—Take 5 c.c. (1 large teaspoonful) of the solution in a clean test tube, add to it 8 drops of urine, boil vigorously for 2 minutes over a spirit flame, or for 5 minutes in boiling water. If much glucose is present the fluid changes from a clear blue to a turbid yellow, or brick-red colour, from the formation of reduced copper oxide. If only a small quantity of glucose is present, the fluid changes from blue to green and is turbid. When green and turbid allow the test tube to stand for 10 minutes, in which time the reduced copper sinks to the bottom and is seen as a red-yellow deposit.

Without this deposit the test is *negative*, even though the colour may change.

3. *Fermentation test.*—Use urine from a 24-hours specimen.

Divide the urine into two parts and take the specific gravity. Boil, cool, render acid (if alkaline), and add to one part a small piece of brewer's yeast; cork and keep both specimens in a warm place for 24 hours. A hole should be made in the cork before use.

Result.—If sugar is present fermentation occurs in the specimen containing the yeast, and the specific gravity is lower than in the other specimen.

Quantitative estimation of sugar.—After making a fermentation test the quantity of sugar is estimated by the difference in specific gravity of the fermented and the non-fermented urine; each degree of density lost equals 1 grain of sugar per ounce.

The Detection of Blood in Urine.—*Appearance.*—Urine turbid, either red or smoky (p. 237).

1. *Guaiacum test.*—Take 1 inch of urine in a test tube, add to it two drops of tincture of guaiacum, shake gently, then float 1 inch of ozonic ether on the surface by pouring it gently down the side of the tube on to the urine; do not shake.

Result.—If blood is present a blue colour appears at the junction of the fluids.

N.B.—The tincture of guaiacum must be prepared from fresh resin, and the ozonic ether must contain in solution peroxide of hydrogen of 30-volume strength; it should give off bubbles of gas when poured into the test tube, otherwise the test may fail.

Fallacies.—If iodides are present in the urine a blue colour results when the test is made. It is distinguished from that due to blood by the fact that it appears much more slowly and appears simultaneously all through the fluid, not at the junction of the fluids only.

2. *Heller's test.*—Place 2 inches of urine in a test tube and render it strongly alkaline by adding liquor potassae. Boil.

Result.—If blood is present a deposit of a brownish-red colour is formed, the fluid being bottle green.

Fallacies.—If the patient is taking senna, santonin, or rhubarb, the test may yield a positive result even when no blood is present; this may be determined by spectroscopic examination.

Spectroscopic examination is necessary to determine exactly the presence of haematoporphyrin and other blood derivatives. Urine containing an excess of haematoporphyrin (haematoporphyrinuria) is of a dark port-wine colour and gives a negative result with the guaiacum test; it occurs sometimes in patients taking sulphonal.

The Detection of Pus in Urine.—*Appearance.*—Cloudy, opaque urine with a whitish deposit (p. 237). The urine is usually alkaline but may be acid. Pus in acid urine denotes pyelitis (see p. 240). Microscopic examination is usual.

1. *Test.*—With a pipette take up the urine containing the deposit from the bottom of the specimen; put it in a test tube and add liquor potassae.

Result.—A gelatinous mass is formed if pus is present; this is easily seen on pouring the mixture from one test tube to another.

2. Take 1 inch of urine in a test tube, add tincture of guaiacum.

Result.—A green colour which disappears on boiling denotes pus.

The Detection of Mucus in Urine.—*Appearance.*—After standing for some time a woolly-looking cloud forms which usually settles at the bottom of the glass; but, if the urine be of high specific gravity, may be in the middle of the glass or even at the top. If traces of blood are present in the urine the cloud may have a brownish tint.

Test.—On adding liquor potassae the mucus is partially or entirely dissolved and does not become ropy as with pus.

The Detection of Bile in Urine.—*Appearance.*—The urine is greenish, or brownish yellow, or dark greenish brown in colour, and somewhat more viscid than normal, so that after shaking the froth which forms on top is unusually permanent, and is green in colour (p. 236). Urine containing salol may resemble it in colour but the froth is not coloured.

1. *Gmelin's test.*—With a pipette allow drops of urine and of fuming nitric acid to trickle together on a porcelain dish.

Result.—If bile is present a play of colours results, green, violet, blue, yellow; of these colours the green one alone is characteristic of bile.

2. *Iodine test.*—Take 1 inch of urine in a test tube, float on top of it by means of a pipette, or pouring gently down the side of the tube, ½ inch of 10 per cent alcoholic solution of iodine.

Result.—If bile is present an emerald-green colour appears at the junction of the fluids.

The Detection of Ketones in Urine (acetone, diacetic acid, aceto-acetic acid).—Ketones are present in the urine in any condition causing acidosis, or ketosis, e.g. fasting (insufficient carbohydrates causing incomplete metabolism of fats), diabetes (p. 289), delayed chloroform poisoning (p. 458), pneumonia (p. 251), shock (p. 561), etc. The urine has a peculiar fruity odour.

1. *Rothera's test for acetone and diacetic acid.*—Take 1 inch of urine in a test tube and add 1 teaspoonful of crystals of ammonium sulphate, and thoroughly shake. Add 5 drops of freshly-prepared 5 per cent solution of sodium nitro-prusside, followed by 1 inch of concentrated ammonia. Mix.

Result.—A characteristic purple permanganate colour indicates the presence of acetone or diacetic acid. N.B.—The specimen should be allowed to stand for 30 minutes before deciding the test is negative.

2. *Gerhardt's test for aceto-acetic acid (diacetic acid).*—Take 1 inch of urine in two test tubes, boil one of the tubes for one minute; to each of the tubes add liquor ferri perchloridi drop by drop until no further precipitate of phosphates falls.

Result.—A claret-red colour in the unboiled urine denotes the presence of aceto-acetic acid, whilst the boiled specimen will remain a biscuit brown. In doubtful cases, filter, and add some more liquor ferri perchloridi to the filtrate.

N.B.—A positive ferric chloride test is a sign of a dangerous acidosis (p. 289) requiring immediate treatment.

Fallacies.—A similar, but bluer colour is given by salicylic acid and by other bodies excreted in the urine after such drugs as aspirin, antipyrin, etc. have been taken by mouth. The colour they produce does not disappear on boiling, whereas aceto-acetic acid is changed into acetone, and the colour grows fainter or disappears entirely.

Test for Indican in Urine.—Indican is a product of indol, which is produced as a result of bacterial decomposition of food in the intestine. Traces of indican may be present in normal urine; it is increased in all conditions associated with excessive putrefaction and in some fevers.

It is much increased whenever the intestinal contents have been unduly retained—e.g. in chronic constipation and intestinal obstruction.

Test.—To a quarter of a test tube full of urine add an equal amount of strong hydrochloric acid. Then drop in slowly a freshly prepared solution of bleaching powder (1–20), shaking the mixture all the time. Add half an inch of chloroform and shake thoroughly. The chloroform will be coloured blue or pink if indican is present.

Urine Test for Typhoid Fever (Ehrlich Diazo Reaction).—*Solution A.*—Saturated solution of sulphanilic acid in dilute (1–20) hydrochloric acid. *Solution B.*—Five per cent solution of sodium nitrate in distilled water.

Test.—Mix forty parts of A with one of B just before use; add an equal quantity of urine, and shake until there is a froth on the surface. Add a few drops of strong ammonia; a pinkish-red colour in the froth indicates enteric (it occurs occasionally in other diseases).

It may occur in measles, in rapidly advancing tuberculous disease, and very exceptionally in German measles. It is present in typhoid in the second and third week, unless a very mild case.

Microscopic Examination.—Urine containing albumin, blood, or pus is usually examined pathologically (p. 122) in addition to the tests described.

STERILIZATION (see also p. 828)

1. **Dry Method.**—*Swabs, dressings, gauze, wool, and bandages, towels, overalls, etc.*—Prepare the swabs and dressings by making into packets containing the required amount for each operation or dressing; also packets of overalls, caps, masks, and towels. These packets are then enclosed in a wrapper, which consists of calico lined with non-absorbent wool, tin boxes, or a drum.

To pack a drum for an operation.—Two drums are necessary. First drum: line with a towel and place in it the following articles in this order, starting from the bottom up: towels, masks, caps, overalls. Second drum: packet containing bandage, pins, wool, gauze, towel, swabs (swabs for abdominal operations must be counted and made up in packets of ten fastened together with a pin or with a threaded tape); abdominal cloths (counted); swabs as before; towels. The lid is then closed and the slide around the drum opened to expose the holes. Tin boxes have the lids propped open during sterilization. On removal from the sterilizer the slide of the drum is closed; the boxes have their lids securely fastened down.

It is important to pack the drums as described so that the things may be exposed in the order required at the operation or dressing.

Drums, packets, and boxes are placed in a steam sterilizer and subjected to a temperature of 248° F., or 15 lb. pressure for 20 minutes. Where it is not possible to use steam pressure, a temperature of 212° F. should be maintained for one hour, for although all bacteria are destroyed at this temperature in 20 minutes, the more resistant spores are unaffected (see temperature, p. 829).

Dry heat is sometimes used; a temperature of 302° F. for half an hour is required, but is much more destructive to the articles subjected to it than steam sterilization.

Dry sterilized articles must remain covered in the drums or wrappers until the moment they are required for use, as exposure to the air contaminates them. A properly constructed and reliable sterilizer is necessary for dry sterilization; it is not safe to trust to a makeshift method.

Dressings, towels, and all requisites for an operation or a dressing may be procured ready sterilized from any of the principal instrument firms. Failing this, the articles should be sterilized by the wet method described below.

2. **Wet Method.**—*Swabs, unmedicated gauze, lint, etc.*—Boil the swabs, etc. for one hour, then wring them out in a sterilized wringer and place them in a covered jar containing an antiseptic solution, either carbolic (1–20) or perchloride of mercury (1–1000), until required. Before use they are immersed in hot perchloride of

mercury (1–2000), or the lotion preferred by the surgeon. Plain white gauze and white lint are prepared in the same way.

Swabs.—Swabs, or dabs, used for dressings may be of many different shapes and patterns according to the teaching of various hospitals. Common varieties are described as follows:

(1) *For dressings and cleansing purposes.*

Absorbent wool swabs may be either spherical or elongated in shape and vary in size. They are made by gently rolling the required sized piece of dry wool loosely between the palms of the hands until a light loose ball of wool is made. Small ones are used for cleansing eyes and the external cleansing of the nose and ear.

Medium ones are required for dressing wounds. Large ones are used for vagina, rectum, etc.

Elongated wool swabs are made by rolling dry wool in the finger-tips to the required length and thickness, the ends being formed into a point. They are used for swabbing out cavities such as the ear and nose.

Mouth swabs, or mop sticks, are made as follows: 2-inch squares of dry absorbent wool are wrung out of boiling water, using a wringer; they are then flattened on a clean surface. A thin layer is then peeled off and wound around the end of the mop stick. These are used for the toilet of the mouth.

(2) *For operative surgery.* Plate XVIII.

(*a*) Three-inch squares of folded gauze, nine layers in thickness.

(*b*) Three-inch squares of absorbent wool, enclosed in muslin and sewn.

(*c*) Abdominal packs. Fourteen-inch squares of muslin, four layers in thickness, and sewn round all edges. To one corner a piece of tape 12 inches in length is sewn; the end of the tape is securely attached to a stainless steel ring.

(*d*) Eye swabs. (i) Wool swabs. Place the required amount of absorbent wool in a sterile wringer, pour over it either boiling water, boiling boracic, or boiling perchloride of mercury (1–5000). Wring it out and flatten the wool by pressing it down between folds of a sterile towel. With sterile scissors, cut into strips of the required width, peel off extremely thin layers, cutting them into squares. The wool should not be wrung too dry or the swabs will be fluffy. Keep in sterile air-tight glass jar until required. (ii) Squares 1 inch in size are cut from white lint, or ribbon gauze with selvedge edge may be used.

(*e*) Vaginal tampons are made from 3-inch squares of absorbent wool rolled tightly into a ball and enclosed in muslin, tied with tape which is sufficiently long to protrude beyond the vaginal orifice when the tampon is in position.

Materials for swab making should be kept as clean as possible. Wool, lint, and muslin are wrapped in a clean towel when removed from their original wrappers; made on a clean dustless surface, and the hands are washed and dried before making the swabs. Swabs can be made at odd moments when urgent duties are done, and thus a prepared stock is ever ready.

To prepare wool for making eye swabs. Place the required amount of absorbent wool in a sterile wringer, pour over it boiling water. Some surgeons prefer boiling boracic or boiling perchloride of mercury (1–5000). Wring it out and flatten it by pressing it between a sterile wet towel. Cut into strips of the required size, peel off extremely thin layers, and cut to the desired size. The wool should not be wrung too dry or it will be fluffy.

Crockery.—Steam sterilize or boil for half an hour. When needed in a hurry, a dressing bowl may be rendered sterile by 'flaming,' as follows: swab the bowl round with methylated spirit, leaving a teaspoonful at the bottom, ignite, and leave in a safe place to burn out. *Antiseptic Method.*—Steep in carbolic (1–20) for two hours.

Rubber.—*Drainage tubing, rubber catheters, rubber tubes, etc.*—Cleanse by holding under running cold water, with the eye uppermost. Syringe through with cold water, then hot water until quite clean; wash in hot soapy water, rinse and syringe through with carbolic (1–20); immerse in the same, then sterilize by boiling for 20 minutes. Drainage tubing and rubber catheters may be kept in carbolic (1–20) when not in use; they will then not require further boiling before use. Stomach tubes, Southey's tubing, etc. are usually kept dry; before putting them away they should be hung up to drain until absolutely dry; they will require boiling before use; catheters may be kept in this way also if preferred.

Sterilization of Rubber Gloves.—1. *Wet Method.*—Gloves are washed clean and put into a bag which is large enough to contain them without tight packing. They are then boiled in the ordinary sterilizer for 20 minutes, and the bag then put into a cold antiseptic solution until the surgeon is ready for them. Putting on rubber gloves is more easily accomplished if the gloves are filled with the lotion, the hand being inserted into the glove containing the fluid.

2. *Dry Method.*—Gloves are cleaned and dried and turned inside out and dusted with sterile talc or a boracic and zinc oxide powder, and the outside similarly dusted. They are then wrapped, each glove separately, in a thin layer of white gauze or other porous material, and then placed in a drum or dressing bag and sterilized by super-heated steam at the pressure of 10 lb. to the square

inch, for 20 minutes, allowed to cool off, and then heated again for 20 minutes.

Note.—When powdering gloves that are to be used at once, they should always be kept dry and powdered inside and out in the manner described. It is not enough to shake some powder into the glove, as out of a pepper-pot.

Mackintoshes.—Cleanse by scrubbing in cold water and liq. ammon. ʒj-Oj, then in hot soapy water; rinse in cold water, and soak in carbolic (1–20) for half an hour; hang up until dry. Batiste mackintosh will stand boiling but is spoilt by dry sterilization. Jaconet is spoilt by boiling.

Green Protective, Oiled Skin, Celluloid.—Wash in warm soapy water; rinse and immerse in carbolic (1–20) for five minutes; soak in perchloride of mercury (1–1000) for 12 hours, then in sterilized saline solution until required for use. Only the amount required should be prepared; it should be cut to the required size and perforated with small holes before sterilization. If several pieces are required, they must be separated by folds of sterile gauze before soaking. Celluloid is prepared by soaking in the same manner. Tin or silver foil is sterilized by boiling for 20 minutes before use.

Gum Elastic Catheters, Tubes, etc.—Cleanse by washing under cold running water, then warm water; syringe through cold, then warm, water; wash in warm soapy water; rinse, syringe through perchloride of mercury (1–1000); leave soaking for three minutes. Wipe with a cloth, hang up till dry, then place in an air-tight jar containing dry formalin. The catheters should lie flat or hang from a frame. Leave for 12 hours or until required for use. Gum elastic instruments are ruined by boiling or soaking in carbolic, and become roughened if allowed to soak in perchlorate of mercury for any length of time.

Metal Instruments.—1. *To cleanse instruments.*—Wash and scrub in cold water to remove the blood stains, then in hot soapy water, using Sapolio to remove stains if necessary; wash in clean water and boil for 20 minutes; remove from the boiling water and place in alcohol, then dry thoroughly; especial care is needed at the joints and serrated ends. Before being put away the joints of delicate instruments may be slightly smeared with paroleine to prevent them getting stiff. Instruments should be dried on a clean fine cloth, then polished with a chamois leather. If further polishing is required and allowed, whitening made moist with alcohol may be used. Care is required in order to remove all the powder; a brush should be used for this purpose.

2. *To sterilize instruments.*—Place in boiling water containing washing soda, 1 per cent solution. Boil for 20 minutes. The

water must entirely cover the instruments or they will rust. All shutting instruments, such as Spencer-Wells forceps, should be opened before being sterilized.

Sharp cutting instruments, knives, needles, etc.—These instruments are blunted by prolonged boiling; they should be sterilized before putting in other instruments. Boil for five minutes and immerse in alcohol until required; or they may be sterilized without boiling by placing in pure carbolic for one minute; remove with forceps, wash in hot sterilized water and place in alcohol. Delicate cutting instruments such as cataract knives, etc. may be sterilized by immersion in absolute alcohol for a few minutes, after which they are placed in spirit until required for use. When sterile, instruments are placed in either sterilized water, alcohol, or an antiseptic solution according to the wishes of the surgeon, or they may be used dry, arranged on a sterile cloth.

Hollow Needles.—1. *To clean.*—Wash in cold water by syringing through until clean; sterilize, syringe through with alcohol, dry and thread with wire which should project well beyond the point.

2. *To sterilize.*—Boil for ten minutes, and place in alcohol until required. Small needles may be boiled in a test tube or glass bowl over a spirit lamp. Hypodermic needles may be sterilized without boiling by syringing through with carbolic (1–20) followed by alcohol (see hypodermic injection, p. 84).

Silver Catheters, Cannulae, etc.—1. *To clean.*—Cleanse as described under catheters, scrub in hot soapy water, rinse, boil for 20 minutes, dry and polish; when dry insert stilette.

2. *To sterilize.*—Boil in soda water 1 per cent; the stilette should be boiled at the same time but should be removed from the catheter; place in warm boracic or the solution preferred by the surgeon. Trocars and cannulae are treated in the same way, the trocar being removed before boiling.

Glass Syringes, Glass Tubes, etc.—Remove the piston from the syringe, place them in warm water, bring them to the boil and boil for 20 minutes; place in boiling water or hot antiseptic solution until required. Many surgeons prefer the syringe to be brought to the bedside in the sterilizer.

Metal Syringes with metal pistons may be boiled in the same way as metal instruments. Syringes of glass, metal, or both combined, fitted with washers and not intended for boiling, are sterilized as follows: Fill the syringe first with cold water, then with carbolic (1–20) and allow it to soak in the same solution for half an hour; empty and fill with alcohol until required for use.

Sutures.—1. *Silkworm gut.*—Place the silkworm gut in a glass jar containing hot perchloride of mercury (1–500) for 24 hours;

empty the solution and boil the gut for 20 minutes in plain boiling water; remove from the sterilizer and place in alcohol in a glass-stoppered jar. Before use, the silkworm gut is boiled for three minutes in order to soften it; it is not injured by repeated boiling.

2. *Horsehair.*—Cleanse by scrubbing with hot soapy water, rinse in carbolic (1–20), boil for half an hour in plain boiling water and place in glass-stoppered jar containing carbolic (1–20) or alcohol; it is ready for use without further sterilizing.

3. *Silk.*—Wind on glass spools and boil in plain water for two hours, or the silk may be dry sterilized with the dressings. The silk is re-sterilized each time before use. If sterilized by boiling, the spools of silk may be kept in covered glass jars filled with carbolic (1–20).

4. *Silver wire.*—Scrub with hot water and soap; sterilize each time before use in the same manner as metal instruments.

5. *Catgut.*—Catgut is most commonly procured after it has been prepared; the most usual form of preparation being the chromicized catgut; other preparations are iodized, formalin, and plain. Prepared catgut is placed in sterilized glass-stoppered jars containing either alcohol or sterilized glycerine. Chromicized catgut may be boiled for ten minutes before use. Prepared catgut may be obtained in sealed glass tubes; this is the most convenient form for private work and is very often used in hospitals. Before breaking the tubes they should be rendered sterile outside by soaking in carbolic (1–20).

6. *Kangaroo tendon* may be obtained prepared in the same way.

Nail Brushes.—Soak in cold water, then boil for ten minutes and place in an antiseptic solution; or they may be dry sterilized and placed in either sterile water or an antiseptic solution.

Oils and Ointments are commonly supplied sterile, in jars or tubes, but after use may be re-sterilized by the dry method in a glass jar or by boiling. To boil, place in a glass jar and stand it in warm water, bring the water to the boil and allow it to boil for an hour; or boil for half an hour for three successive days before use. Allow the jar to cool gradually to prevent cracking. The stopper should be lightly placed over a fold of gauze whilst boiling; this is removed when finished and the stopper put in without the gauze.

Lotions made with sterile water require no further sterilization, with the exception of normal saline solution and boracic; these require boiling in a flask for ten minutes if not sterile when supplied. The glass flask may be placed directly on a square of perforated zinc over a gas ring. A piece of absorbent wool may be placed in the mouth during sterilization; when finished replace the absorbent wool with a plug of sterilized non-absorbent wool. A convenient way of making salt solution when a large quantity is required is the following: Fill the flask with saline prepared to the strength of ʒj–℥j; when required for use take ℥j from the flask and add ℥xix of sterilized water either hot or cold as required. Saline solution required for operations, subcutaneous or intravenous infusion must be sterilized daily, and may be obtained in sterile flasks containing the sterile solution, with sterile attachments and needles ready for use, from instrument firms supplying operation outfits.

To prepare Marine Sponges.—Marine sponges are seldom used nowadays except for mouth operations and for swabbing out the throat during the administration of an anaesthetic. It is, however, advisable for the nurse to know how to prepare them. Fine, round, even sponges should be selected. Turkey sponges are the most suitable for the mouth and throat.

1. *To prepare.*—(1) Beat with a wooden mallet to break up and remove all sand, coral, shell, and dust. Wash at intervals in cold water; pick out any pieces, dry, and repeat the process until free of all dirt. (2) Soak in a 2 per cent solution of hydrochloric acid for ten minutes, stirring occasionally with a stick. This will dissolve any remaining lime deposits. (3) Pour off the acid and leave under running cold water until free of the acid. (4) Soak in a 2 per cent solution of washing soda for 12 hours. (5) Wash in two or three waters, then hang in a muslin bag to dry. (6) Pick off any loose pieces; place in a sterilized jar, cover with carbolic (1–20) and a well-fitting lid and leave for one week, changing the lotion at the end of the third day. (7) Put into clean carbolic lotion (1–20) when they are ready for use. Before use they may be soaked in the lotion preferred by the surgeon.

2. *To cleanse after use.*—If used for a clean case they may be used after cleansing, otherwise they should be destroyed. (1) Soak in cold water until free of blood. (2) Wash in hot soda solution 1 per cent. Leave soaking in clean soda solution for six hours. Wash in clean water; pick off any loose pieces and hang in a muslin bag to dry. When dry, soak in carbolic (1–20) for three days, they are then ready for use. If preferred, the sponges may be kept dry when they are not in use, but must be soaked in carbolic (1–20) for at least three days before required.

The Nurse's Hands.—*To purify the hands.*—1. Before attending operations, etc. 2. Before douching, catheterization, minor dressings, etc. 3. To disinfect after touching infectious patients or articles.

1. See Chapter XII, p. 431.
2. Turn up the sleeves above the elbows; scrub the hands and

arms to the elbow with hot water and soap. Immerse in Dettol, Lysol 2 per cent solution, or perchloride of mercury (1–2000).

3. The sleeves should be turned up before attending to the patient. Scrub the hands and arms in Lysol (2 per cent) with a nail brush; thoroughly wash and scrub with hot water and antiseptic soap; immerse either in carbolic (1–40), perchloride, or biniodide of mercury (1–2000), or Lysol (2 per cent).

The care of the hands.—When constantly using antiseptic lotions the hands are apt to become roughened and sore and therefore difficult to cleanse. To prevent this the hands should be well rubbed with glycerine and red lotion equal parts each time before drying; they will be greatly improved by rubbing with olive oil before washing. Some form of grease should be applied at night, either boric ointment, hazeline, or cold cream. Nurses with sensitive skin should endeavour to wear gloves for all dressing or other duties which necessitate keeping the hands in antiseptics for any length of time.

The following is a useful preparation for the hands; it is easily prepared and may be carried in the pocket if desired: Take of glycerine ℥ij, powdered starch ʒj, red lotion ℥j. Dissolve the starch in the red lotion, add the glycerine and place over a gas ring, stir till boiling, then pour into a glass jar with a screw top. When cold it will form a thin jelly, and it is then ready for use. Anoint the hands each time after drying them.

Disinfection.—1. *Room, clothing, books, etc.*—*Fumigation.*—Close and seal the windows by pasting strips of paper over the crevices. Open all drawers, cupboards, etc., and spread the clothing so that the disinfectant may permeate all through. Books should be opened and taken off the shelves. Either formalin or sulphur may be used, and candles of either may be obtained. If formalin tablets are used they are placed in the receptacle provided with a vaporizing lamp; if sulphur is used it is placed on a shovel or enamel plate standing in a bucket of water; the sulphur is moistened with alcohol and lighted. Care must be taken to see that whatever method is used there is no possibility of fire occurring. If the candle, lamp, or lighted sulphur is placed in a bucket containing water it will be safe. Close the door and cover up the keyhole and crevices with paper and paste. The keyhole is plugged from outside so as to watch for fire. Leave for 24 hours, then open the door and windows and allow as much sun and air to penetrate as possible. The room should then undergo a thorough cleaning, the walls being rubbed down with dough, the floor scrubbed, windows cleaned, while everything washable should be washed.

2. *Clothing, sheets, linen, etc.*—During the illness all washing

articles should be immersed in carbolic (1–20) (any mercurial disinfectant ruins linen, and should never be used) or other suitable disinfectant for four hours before being sent to the laundry; a small bath or tank should be kept for this purpose. Linen disinfected in the room at the end of the case will not require this treatment. Non-washable articles are disinfected as described under 'Room,' p. 47.

3. *Crockery, feeding utensils, glass, lavatory utensils, etc.*—Place the article after cleansing in a bath containing carbolic (1–20) for four hours; remove, wash in hot water and chlorinated soda. Another way is to boil the crockery in a sterilizer or clothes-boiler for half an hour.

4. *Excreta, faeces, urine, sputum.*—Mix the excreta with an equal quantity of suitable disinfectant, cover with the lid and over this place a cloth wrung out of a disinfectant. Stand the vessel in a lavatory or other suitable place, as near an open window as possible, for two hours, then empty, cleanse, and disinfect the receptacle.

5. *Suitable disinfectants are* carbolic powder; carbolic (1–20); formaldehyde (commercial, 5 per cent); a cupful of commercial unslaked lime in hot water; chlorinated lime (10 per cent). In hospitals provided with a steam sterilizer for excreta, the stools are sterilized for 30 minutes. In country places unprovided with drainage, the stools should be treated with a cupful of unslaked lime and hot water, allowed to stand for two hours, then buried in the earth as far from the dwelling and from any possible contamination of the water supply and kitchen-garden as possible. The lime generates sufficient heat to destroy the bacteria. Sputum, infectious dressings, swabs, etc. must all be destroyed immediately by burning.

6. *The patient.*—Prepare a bath containing a disinfectant (p. 118) and suitable disinfectant soap. Wash the patient all over thoroughly and allow to soak in the bath for 15 minutes. After washing the hair rinse it with either carbolic (1–60) or perchloride of mercury (1–2000). Whilst the patient is soaking put on a clean overall, then wrap the patient in a clean bath sheet which has not been in the infected area and take into an adjoining room in which the clean garments and towels have been prepared. Some doctors recommend the patient being rubbed over with either eucalyptus or carbolic oil after the bath.

7. *The nurse.*—After disinfecting the patient, the room, etc., the nurse must take a disinfectant bath, wash (p. 118) and disinfect her hair, and dress in clean clothing which has not been in the infected area. She must disinfect her clothing, either by placing

it in the room to be disinfected or by soaking it as described for washable articles (p. 47). Hairpins must be disinfected by soaking in carbolic (1–20). A convenient method is to have a tub of disinfectant in the bathroom, into which the clothes may be placed before taking the bath.

The Last Offices of the Dead.—This is a solemn duty which should be performed with reverence, silence, tenderness, and thoroughness. The nurse should realize the solemnity of the duty; a prayer should be said before commencing the 'laying out.'

When death has taken place, close the eyelids. If the friends are present leave the bedside for a few minutes. After the friends have left the room, strip the bed, leaving the upper sheet; remove garments, hot bottles, water or air cushions, etc.; leave one small pillow under the head if necessary. Straighten the limbs, draw the sheet, and tidy the under-sheet. Remove any false teeth, rings, and jewellery unless otherwise desired by the friends. Apply a jaw bandage (p. 144), not too tightly; tie the ankles and big toes together. Cover the body entirely with the top sheet and leave for an hour. Draw down the blinds and remove everything that has been used from the room, leaving it perfectly tidy. At the end of the hour, having prepared everything beforehand, proceed to 'lay out' the body. Two persons render this task easier, but it can be managed by one.

Thoroughly wash the body all over with water containing Lysol, using plenty of soap. Clean and cut the nails, plug the orifices with cotton wool (non-absorbent). In surgical cases remove any dressings, tubes, or other appliances; re-cover the wound after cleansing with white gauze and wool, and fasten with collodion or a bandage. If a bandage is used it should be stitched, not pinned.

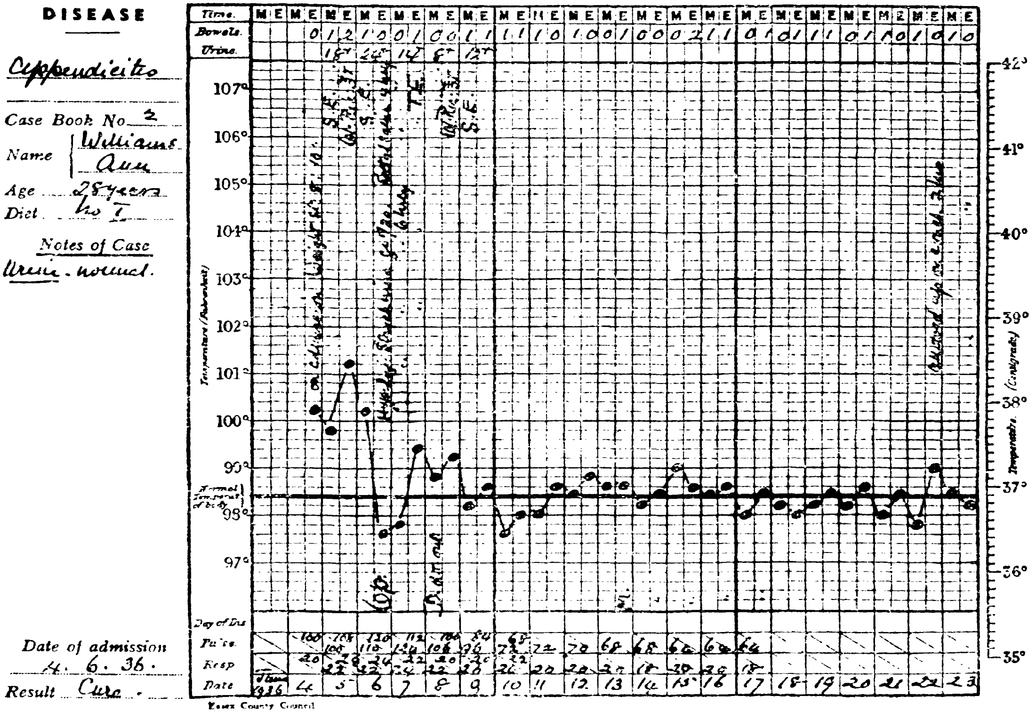
Comb and brush the hair; in the case of a woman plait it in two plaits and tie with white ribbon. Dress in a clean nightgown or the garment provided; white stockings are usually worn. The arms may be folded across the chest or placed at the sides. Put in a clean under-sheet and drawsheet, a clean pillowslip. Cover the body with a clean sheet as far as the chin and cover the face with a clean handkerchief.

In hospitals, where the body is removed when 'laid out,' attach a label to the left ankle with the name of the patient, the ward, number, date, and time of death. The body is then securely wrapped in a sheet, the ends are neatly folded over the head and feet, the middle of the sheet being stitched if necessary.

If not present, the doctor must be informed immediately of the patient's death. The friends, or those responsible, must be communicated with at once if death occurred in their absence.

Report and Chart Keeping.—A report should always be kept by the nurse whether the patient is in hospital or treated privately. The following is a convenient method. A book is used, one page is ruled for day, the opposite one for night report, so that the report for 24 hours is all on one sheet. The upper part of each page is ruled into columns for the following: date and time, bowels, urine, vomit, sleep; a wide space is left for remarks, in which any unusual symptom is noted, the remaining space for the doctor's orders. The lower half of the page is used to enter any treatment given, such as food, injections, infusions, dressings, etc.

Charting.—The temperature should be charted at the time it is taken, also the pulse and respiration. It is more convenient and neater to chart the urine, bowels, vomit, etc. from the report book in the morning. Aperients and enemata (evacuant) should be charted immediately below the top line; vomit may be charted below this. Dressings may be noted by a D on the lower border of the chart; menstruation may be charted by M in the same place. Other items which many physicians like charted are sleeping draughts, injections, fits, etc.; these may be charted above the temperature. Weight should be charted in the same line each week (Fig. 13). A night and morning chart is divided into days by a thin line, and into weeks by a thick line; the first space should represent the first day of the week, therefore, when starting a chart, the space corresponding to that day of the week should be the one used. Four- or two-hour charts are ruled by thin lines into 4 or 2 hours, and by thick lines into 12 or 24 hours. When a 4-hour or 2-hour chart is in use, a night and morning chart should also be kept, the temperature being copied from the 4- or 2-hour chart at the same time night and morning. The 2- or 4-hour chart need then only show the temperature, pulse, respiration, urine, and bowels (Fig. 14), the night and morning chart containing all additional information. The night temperatures may be charted in red ink and the day in black ink, if desired, on the 4-hour chart.



DISEASE

Appendicitis

Case Book No 2

Name Williams
Ann

Age 28 years

Diet No 1

Notes of Case

Urine - normal.

Date of admission
4. 6. 36.

Result Cure.

FIG. 13. Night and morning chart completed, showing method of charting from the four-hour chart (Fig. 14). The patient was admitted on a Monday.

Four-Hour Chart.

DISEASE.

Appendicitis

PARTICULARS.

Name Williams
Ann
Age 22 years
Diet No. I
Case Book No. 482

Admitted
2. V. 37 193
Result Cure

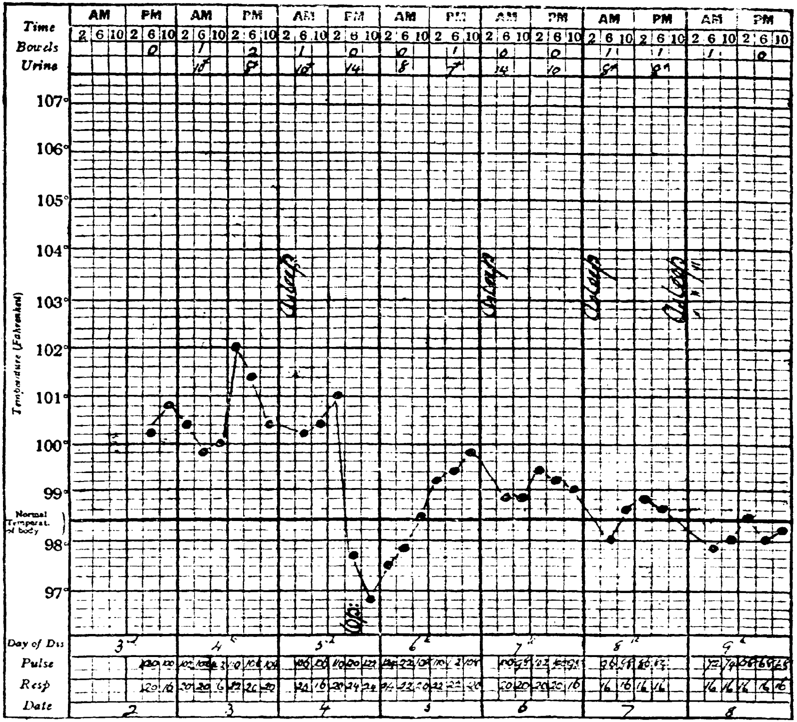


FIG. 14. Four-hour chart corresponding to the night and morning chart (Fig. 13).

CHAPTER III

PARTICULAR METHODS OF TREATMENT

Artificial Feeding.—Artificial feeding may be administered through the following orifices: 1. The mouth, by spoon, suction, or tube (oesophageal feeding). 2. The nose (nasal feeding). 3. Artificial openings (gastrostomy, jejunostomy, oesophagostomy). 4. The rectum, by enemata and suppositories.

General rules for artificial feeding.—The temperature of the food must be taken, and should be 99°–100° F. unless otherwise ordered. The food requires to be carefully measured, the prescribed quantity being given, and administered at regular and suitable intervals.

Domestic and surgical cleanliness is to be observed with regard to all the apparatus used, the nurse's hands, and the orifices through which the food is to be administered.

The necessary apparatus, together with all that will be required, is previously prepared on a tray (Fig. 15), covered with a clean towel, and placed on a table at the right-hand side of the patient. When using tubing and funnel, always refill the funnel before it becomes empty, in order to prevent the entrance of air. The food must be given privately; great gentleness, tact, and patience should be exercised; force must on no account be used when passing a tube. In some cases it will be necessary to have assistance, especially with mental, delirious, or hysterical patients; in these cases some restraint by the assistant is required to ensure the tube being passed harmlessly. With children the hands should be held. In the case of a patient objecting and refusing to be fed, a little tactful persuasion will often induce submission; but should this not be the case, the nurse must inform the doctor, who will decide whether forcible restraint is to be used, and if so, to what extent. The only restraint a nurse should employ is holding the patient's head and hands; in the case of a difficult child, it is a good plan to pinion its arms to its sides by rolling the body and legs in a blanket, leaving the head free (Plate XXXVII). No form of artificial feeding should cause pain if deftly and correctly administered. A resisting patient may cause himself pain and discomfort, but the passage of the tube need not be the cause.

FIG. 15. Tray of polished tin.

1. **The Mouth.**—(*a*) *Spoon feeding.*—This may be undertaken for the following conditions: When the patient is unable to feed himself owing to accident or disease, such as extreme weakness, paralysis (p. 361), chorea (p. 389), tetanus (p. 582); or in the case of infants when, owing either to deformity, such as hare-lip or cleft palate (p. 609), or weakness, they are unable to suck.

When spoon feeding, care must be taken that the correct sized spoon is used; that the patient is not unduly hurried, plenty of time being allowed for mastication if solid food is being given; that the food is hot, but not too hot; that it is carefully administered so that it does not run down outside the mouth and so cause discomfort. In patients suffering from chorea and tetanus, spoon feeding is often a difficult task, and requires skill, tact, and patience on the part of the nurse.

To feed infants with hare-lip and cleft palate who have not been operated upon.—Place the baby flat on the knee, spoon feed, putting the milk well to the back of the mouth, otherwise most of the food will return through the cleft. Special teats may be bought, which are partly covered with a guard; these in some cases enable the child to suck.

(*b*) *Suction feeding.*—This method chiefly applies to infants and is the natural way, but in many instances the natural method has to be abandoned, the child still being fed by suction but by artificial means, i.e. a feeding bottle (see infant feeding, p. 592). Another method of feeding by suction (Wolfenden's method) is employed for children who have been intubated (p. 666) for a chronic stenosis of the trachea. It is used instead of nasal feeding in cases in which the tube is likely to be worn for some time (p. 604).

Method.—Put the food into a mug on a tray and stand it on a stool about half a yard below the level of the bed. Place a glass pipette with a teat attached to it in the mug. The child lies across the bed on its face and sucks up the food through the tube by means of the teat; plain water is sucked up when the food is finished. This method keeps the intubation tube clean and free from particles of food, and there is no tendency to choking.

(*c*) *By tube.*—Oesophageal feeding.—*Gavage.*—*Apparatus required.*—Oesophageal tube joined by a glass connection to a piece of rubber tubing to which a glass funnel is attached and which, after sterilization, is placed in a bowl of warm water; the food in a measure jug standing in a bowl of warm water; a lubricant, either butter or glycerine; and a large mackintosh.

Position.—Sitting up if possible, otherwise dorsal.

Method.—Fasten the mackintosh around the patient's neck; then cleanse the mouth; this is especially necessary in operation cases, and for these it is usual to syringe out the mouth with an antiseptic such as Sanitas (1–20) before and after feeding. After cleansing the mouth, place the forefinger of the left hand on the patient's tongue as far back as possible. Hold the tube in the right hand and pass it along the floor of the mouth over the finger of the left hand; then use the finger of the left hand to steady the tube and keep it in position whilst it is gradually pushed onwards with the right hand. Direct the patient to swallow if possible, and as he does so pass the tube onwards. It is not necessary to pass the tube down more than four or five inches into the oesophagus. Retching is avoided by passing the tube as quickly as possible. Having passed the tube, fill it with food after clamping it, and expel the air by compressing the tube in the direction of the funnel; release the clamp and allow the food to flow down fairly quickly. When finished, compress the tube and withdraw it in one quick pull in order to avoid the patient retching; then cleanse the mouth. The nurse must, of course, not put her finger in the patient's mouth if he is resisting unless he has been suitably gagged.

Food is administered every 4 or 6 hours. The quantity varies from ½ to 1 pint of food according to the age of the patient.

Spouted feeder with rubber tube.—Food may also be administered through a spouted feeder to which a piece of rubber tubing has been attached.

Method.—Place the end of the tube at the back of the patient's mouth and allow the food to run down. The tube must be kept in position until the feeder is empty. (For feeding a patient with spouted feeder see p. 30.) This method is quite satisfactory in some of the minor operations on the mouth or tongue.

2. **Nasal Feeding.**—By this method food is introduced into the stomach through a tube which is inserted into the nostril and passed through the nose, naso-pharynx, and pharynx, through the oesophagus into the stomach.

Apparatus required.—Jacques's rubber catheter No. 8, or small marked oesophageal tube, joined by a glass connection to a piece of tubing about ½ yard long to which a glass funnel is attached; clip forceps; bowl of warm sterile water into which the apparatus should be put after being sterilized; food in a measure jug standing in hot water; a lubricant, either butter or olive oil or liquid paraffin; small bowl of swabs in boracic lotion; mackintosh.

Position.—Dorsal or sitting up.

Method.—Arrange the mackintosh so that the patient's clothes are protected. Swab and cleanse the nostrils. Lubricate the portion of catheter or tube that will enter the nose. With the left hand steady the patient's head; hold the tubing in the right hand

and insert the catheter into the nostril pointing the tip backwards, not upwards, through the pharynx and oesophagus into the stomach, about 12 inches from the nostril. The mark on the tube when it is level with the nostril indicates the end of the tube is in the stomach, unless it has curled up in the mouth in passing. Next make sure that the tube has entered the stomach and is not curled up, in the mouth or in the larynx. If air bubbles come up in a steady stream during both expiration and inspiration, and if pressure with the hand on the epigastrium forces out more air, the tube must be in the stomach. If in the larynx, the breathing would be embarrassed, and air would be felt coming through the tube with *expiration* only. If the tube has curled in the mouth it is easily seen on opening the mouth. If, therefore, 12 inches of tubing have passed through the nose without meeting obstruction, and the patient is breathing quietly, and the tube has not curled up in the mouth, the tube is in the stomach. Should there be any doubt remove the tube and pass it again.

Having passed the tube correctly, clamp it as near the nostril as possible and beyond the glass connection; then half-fill the funnel with sterile water; next expel the air by compressing the tube in the direction of the funnel, the glass connection will now be full of water and free of air bubbles. Release the clamp and allow a few drops of water to pass down; if all is satisfactory fill the funnel with food and allow it to pass down fairly quickly. When finished, clamp the tube and remove it quickly; this prevents retching and vomiting. Cleanse the nose and leave the patient comfortable.

Dangers if incorrectly passed.—Choking, bronchitis (p. 248), aspiration pneumonia (p. 254), death.

3. **Artificial Openings.**—Gastrostomy is a direct opening into the stomach through the abdomen; jejunostomy, an opening into the jejunum through the abdomen; oesophagostomy, an opening into the oesophagus through the neck. The apparatus required and the method of administering the food is the same for all.

Gastrostomy feeding.—If a tube has to be introduced each time, these cases, when fed, require to be treated with the same precautions as when dressing a wound (p. 440). If the tube be left in the orifice at the operation (p. 506), the end of the tube is clamped and wrapped in wool and pinned to the outside of the bandage.

(*a*) *Apparatus required when the tube is left* in situ.—A piece of rubber tubing about 6 inches long, to which a glass connection is attached at one end and a glass funnel at the other, after being sterilized (p. 43), and placed in a bowl of warm water; mackintosh; the food in a measure jug standing in a bowl of hot water.

Method.—Arrange the mackintosh over the dressing around the clamped tube. Fix the glass connection to the tube protruding through the dressing and fill the funnel and tubing with food. Expel the air by compressing the tube in the direction of the funnel, and when the glass connection is free of air bubbles unclamp the clip and allow the food to run in slowly. When finished, reclip the tube below the glass connection and disconnect it. Wrap the end in clean, dry wool and fix it to the dressing by passing a safety-pin through the clamp, securing it to the bandage. A spigot may be used to cork the end of the tube left in position. Some surgeons prefer to have water run in through the tube before and after the food, an ounce either time being sufficient; others prefer to omit the water in order that the patient may receive all the nourishment possible.

(*b*) *Apparatus required when the tube is not left in.*—In addition to the articles mentioned above, it will be necessary to provide the following: Jacques's rubber catheter No. 8; clip forceps; and the usual things required for a dressing (p. 440).

Method.—Remove the dressing, using aseptic precautions (p. 440); swab the wound with warm boracic lotion and cover it with a clean piece of gauze. Fill the catheter and tubing with food, then clamp it. Remove the gauze and introduce the catheter into the orifice for 2 or 3 inches. On no account must the slightest force be used, and care must be taken to introduce the catheter into the centre of the opening and not at one side, as otherwise, if the wound around the orifice is not firmly healed, the catheter may be introduced into the peritoneum instead of the stomach and produce fatal results. Having passed the catheter, the food is given in the way already described. When finished, compress the tube and withdraw the catheter. Re-dress the wound. An ointment dressing (p. 441) may be applied around the opening to prevent excoriation of the skin, brought about by contact with any oozing of the gastric contents.

4. **The Rectum.**—See proctoclysis.

Rectal Enemata.—These may be divided into two classes, i.e. infusions and injections.

Proctoclysis.—(*a*) *Rectal Infusions,* in which the fluid introduced is to be retained and absorbed, given for any of the following purposes: feeding, stimulation, medication, and supplying fluid to a dehydrated body.

(*b*) *Rectal Injections,* in which the fluid introduced is not to be retained permanently, given for the purpose of either cleansing the rectum, causing an evacuation of the bowel, promoting the passage of flatus (p. 209), or for the removal of intestinal worms (p. 225).

Suppositories (p. 764) are given for the purpose of nutriment, medication, or to cause an evacuation of the bowel.

General rules for the administration of enemata.—Prepare all the necessary apparatus on a tray (see Fig. 15); neatly cover it over before commencing. Place the tray on a table at the right-hand side of the patient and stand at that side. Run hot water through the syringe or tubing to see that it is in good working order. See that the fluid to be injected is at the prescribed temperature, i.e. 98°–100° F., unless otherwise ordered.

Never inject air. Take only the amount of lubricant that will be required; a small piece of vaseline on a piece of lint, unless a tube of vaseline is used, in which case the tube may be taken. Pots of olive oil or vaseline should not be used unless sterilized each time after use.

Expose the patient as little as possible. Ensure privacy by means of screens. Use both hands for passing the nozzle or tube, the right hand passing the tube, the left-hand forefinger being placed at the orifice to guide the tube and so prevent bungling or hurting the patient.

(*a*) *Infusions to be retained.*—*Apparatus required.*—Rectal tube or Jacques's catheter, No. 8 or 10, joined by means of a glass connection to a long piece of rubber tubing with a funnel attached to the end, in a bowl of hot water; clip forceps; lubricant; swab of dry wool; fluid for injection in a measure jug standing in a bowl of hot water; square of mackintosh covered with a square of linen.

Position.—Left lateral or dorsal (p. 676).

Method.—Place the mackintosh and linen square beneath the patient's buttocks; fill the tube with fluid and clamp it, after expelling the air; lubricate the anus, also the portion of catheter to be passed into the rectum. Pass the tube into the rectum for 2 inches with the right hand, guiding it with the forefinger of the left hand. Unfasten the clamp and allow the fluid to run in slowly by gravity; a quantity of ℥x taking about ½ hour. When given, clamp the tube and withdraw the catheter; swab the anus with the wool and leave the patient dry and comfortable. To ensure the retention of the enema the following points must be observed: That the fluid is at the correct temperature; that it is given slowly; that the rectum is empty; that the bladder has been emptied immediately before administering the enema. A daily rectal wash-out of saline solution or plain water should be given whilst this treatment continues. Should there be difficulty in retaining the infusion, raise the foot of the bed on blocks.

When administering infusions of ½ pint or more, or when *continuous saline infusion* is required, the following method is used.

Apparatus required.—Thermos flask; fitted with two pieces of glass tubing, to one of which the rubber tubing is attached, the other fitted with ball introducing the necessary air to cause the solution to flow. The rectal tube is connected to the tubing by means of a specially constructed glass connection with a thermometer inset, below which is a Ryall's drop indicator which ensures the solution escaping by drops (Fig. 16). If this connection cannot be procured the tubing must be connected in the usual way and the flow regulated to a drop at a time by compressing the tube with a clip. When the thermos flask is unobtainable, a douche can or jug may be substituted, the tube being weighted at the end left in the can; this arrangement will necessitate constant attention to keep the solution at the required temperature; an electric lamp may be adjusted under the douche can to assist in maintaining the temperature. When using the flask, the saline should be at a temperature of 125° F. when put in; for the douche can it requires to be higher, about 130° F., but the temperature will vary with the rate of the flow and the amount of tubing exposed, and must be altered accordingly, so that it is reduced to 100° F. by the time it enters the rectum.

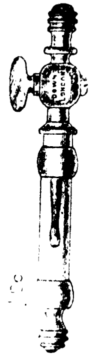


Fig. 16. Ryall's drop indicator.

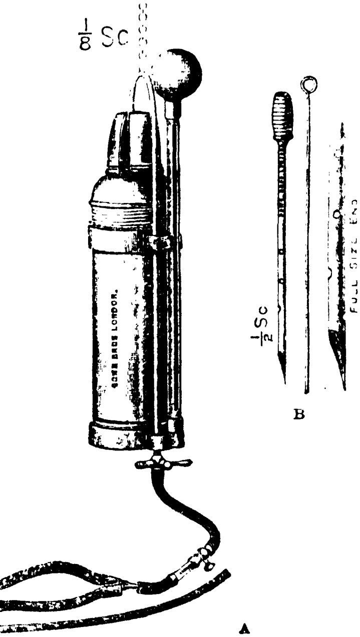


Fig. 17. A. Thermos flask apparatus with Ryall's drop indicator for the administration of saline solution. B. Souttar's needles for cellular tissue.

Position.—Left lateral or dorsal (p. 676).

Method.—Introduce the rectal tube as already described; see that the solution is flowing at the correct rate, and that the tube is free from any pressure; re-cover the patient and arrange as comfortably as possible, protecting the bed in case the rectal tube should be expelled. The apparatus should be watched constantly to make sure the solution is flowing properly and being retained by the patient. Re-fill the flask when necessary.

Nutrient Enemata.—1. Normal saline solution ℥x; glucose ʒj, given every 4 or 6 hours; temperature 100° F. 2. Peptonized milk ℥vj; glucose ʒj; given every 4 or 6 hours; temperature 100° F.

Stimulating Enemata.—1. Normal saline solution ℥x; brandy ℥ss; given every 4 or 6 hours; temperature 105°–120° F. 2. Black coffee ℥vj; brandy ℥j; given once; temperature 105°–110° F. Saline solution by the continuous method is given either plain or with the addition of brandy, or glucose. It may be ordered for cases suffering from shock (p. 561), collapse (p. 562), peritonitis (p. 512), or loss of fluid from haemorrhage (p. 563).

Sedative Enemata.—*Enema Opii.*—Tincture of opium ♏xxx; mucilage of starch ℥ij; mix. To be used almost cold. Given once or as ordered.

Drugs ordered to be given by rectum include bromide, chloral, aspirin, and others. The required dose is diluted up to two or three ounces with warm water and given with rectal tube and funnel. Avertin to promote general anaesthesia may be given by rectum. The required dose of avertin, warmed to a temperature of 80°–90° F., is injected slowly with the rectal tube and funnel. For preparation and after treatment see rectal anaesthesia (p. 451).

Evacuant Enemata.—(*b*) *Injections not to be retained.*—These injections may be given either as ‘ high ’ or ‘ low ’ enemata, terms which indicate the part of the colon it is desired to reach. In giving a low enema the tube is passed into the rectum for a distance of two inches, the fluid being introduced with a Higginson syringe and rubber nozzle.

Drugs to act on the colon, ordered in colitis, are injected slowly and gently as a ‘ high enema ’; these drugs include bismuth, normal saline, albargin, paraffin, silver nitrate, and others.

In giving a high enema the fluid is introduced by means of a soft rectal tube and funnel, the funnel being held only slightly higher than the patient's buttocks. ‘It is useless to introduce the tube more than two inches, as X-ray observations confirm the earlier experiments performed by Goodhart on the dead body, which showed that when the tube reaches the pelvi-rectal flexure its end turns backwards so that it curls up within the rectum, until it may finally project from the anus.’ [1]

Apparatus required.—Large bowl containing the fluid to be injected; Higginson syringe with rubber nozzle; lubricant; square of mackintosh with linen square, bedpan and cover. In giving a high enema, a douche can or rectal tube and funnel, as already described (p. 58), is used.

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[1] *Constipation and Allied Intestinal Disorder.*—Hurst.

Position.—Left lateral or dorsal (p. 676), or knee-elbow (p. 697).

Method.—This is the same as that described (p. 58), except that when the injection is given the tube or nozzle is withdrawn and the patient is lifted on to a bedpan and the rectum is emptied.

To pass the Rectal (Flatus) Tube.—*Requisites.*—Gum elastic or rubber rectal tube (Fig. 18) with an opening at the extremity instead of at the side; bowl of warm water or lotion; lubricant; mackintosh; linen square.

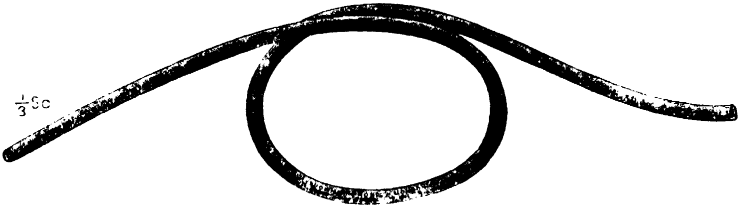


FIG. 18. India-rubber rectal flatus tube.

Method.—Warm the tube by soaking it in the warm water, then lubricate it for two inches and pass, as described for 'high enema' (see above). Place the end in a bowl of water or lotion and observe if flatus is passed. It is usual to leave it in position for 10 minutes or longer, but if left in for a lengthy period care must be taken to arrange the end in a suitable receptacle. Used in cases of flatulence after abdominal operations (p. 502), usually passed 10 hours subsequent to the operation, and then every 4 hours if necessary.

Rectal Lavage consists in irrigating the colon with either plain warm water, or saline solution, at a temperature of 100° F. It is usual to give rectal lavage once in 24 hours to patients ordered rectal feeding, or to those having rectal salines at stated intervals. Infants and young children may also have rectal lavage in place of an enema.

Apparatus required.—Rectal catheter, tube and funnel, lubricant. The water, or saline, at the correct temperature is run in fairly quickly and siphoned back by inverting the funnel over a receiver. Saline, 10 ounces, may be left colon subsequently to relieve thirst.

Positions.—Various positions may be used for lavage and administering evacuant enemata. The *left lateral* (Fig. 251) is the usual position for an evacuant enema; the *dorsal* (Fig. 250) is used for a patient unable to turn; the semi-prone (see Sims position, Fig. 252) used when there is difficulty in retaining the injection; the knee-elbow position (Fig. 258) prior to some rectal operations, or when it is necessary to allow the fluid to reach the higher parts of the colon. For an injection (lavage) given by gravity, all these positions may be used, 10 minutes each position, in the following order, left lateral, dorsal, semi-prone, knee-elbow, right lateral. The catheter is not inserted for more than 2 inches into the rectum, and is kept in place whilst turning into another position. Used in cases of colitis, chronic constipation, some general infections, etc.

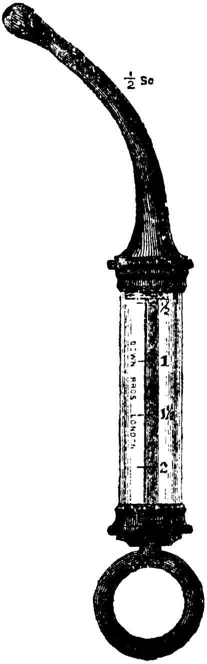


Fig. 19.
Glycerine enema syringe.

Varieties of Evacuant Enemata.—1. *Enema Saponis*, or simple enema. Take of soft soap ʒj; warm water Oj; mix until lathered; temperature 100°–105° F. Given with a Higginson syringe or douche can and rectal tube.

2. *Enema Olei Ricini.*—Take of castor oil ℥j; thin gruel Oj; mix; temperature 100° F. Administered with the rectal tube and funnel.

3. *Enema Olei Olivae.*—Take of olive oil ℥v; heat; temperature 90° F. Administered with rectal tube and funnel, or glycerine syringe (Fig. 19). The olive oil should be retained from 30 to 60 minutes; it may then be followed by a simple enema if necessary (see above).

4. *Enema Glycerini.*—Take of glycerine 1 to 2 drachms; warm water ℥ij; mix; temperature 90° F. Administered with a glycerine enema syringe (see Fig. 19).

5. *Enema Fellis Bovini.*—Two to four drachms of ox bile are mixed with 4–8 ounces of either starch mucilage, water, or saline. Use rectal tube and funnel. Purgative enema.

6. *Enema Magnesium Sulphatis.*—Mix one to two ounces of magnesium sulphate with 4–8 ounces of either water or starch mucilage. Given warm. Use rectal tube and funnel. Purgative enema or to be retained.

7. *Enema Sodii Chloridi.*—Take of sodium chloride (salt) ʒij; warm water Oj; mix; temperature 100° F. Administered with Higginson syringe or rectal tube and funnel.

8. *Enema Terebinthinae.*—Take of turpentine ℥ss–℥j; 1 egg; soap enema Oj. To mix, thoroughly beat up the egg and gradually

drop in the turpentine, beating all the time; this will form an emulsion (p. 764). Add the soap enema, stirring all the time. When finished, if correctly made, no globules of turpentine will be detected floating on the surface. Temperature 100° F. Administered with Higginson syringe or rectal tube and funnel. Carminative enema.

N.B.—The Higginson syringe should not be placed entirely in the solution, as the turpentine destroys the rubber; the end will, of course, have to be in the bowl, but should be removed and the syringe cleansed at the earliest moment possible.

9. *Enema Terebinthinae cum Ol. Ricini.*—Take of oil of turpentine ℥j; castor ℥j; soap enema Oj; 1 egg. Mix the turpentine with the castor oil and proceed to make as for turpentine enema. Use Higginson syringe. Carminative and purgative enema.

10. *Enema Theriacae.*—Mix 3 ounces of molasses with 3 ounces of warm milk, or with 15 ounces of warm water or warm mucilage. Black treacle may also be used. Use rectal tube and funnel. Carminative enema.

11. *Enema Quassia.*—Half a pint of infusion of quassia (1–20); temperature 100° F. The rectum is first cleared with a simple enema (p. 62), the quassia is then injected and retained for ½ hour. Use rectal tube and funnel. Anthelmintic enema.

12. *Enema Asafoetida.*—Asafoetida 30 grains; distilled water 4 fluid ounces. Rub the asafoetida in a mortar, add the water gradually to form an emulsion (strain). Inject at a temperature of 100° F., either plain or added to a simple enema. Use Higginson syringe or rectal tube and funnel. Carminative enema.

13. *Enema Rutae.*—Oil of rue ♏xx; mucilage of acacia ♏ij; soap and water ℥vj. Inject at a temperature of 100° F. Use Higginson syringe or rectal tube and funnel. Carminative enema.

Suppositories.—*To introduce.*—Lubricate the suppository and introduce into the rectum pointed end first. To be retained. 1. Nutrient suppositories consist of foods and are procured ready for insertion. 2. Evacuant suppositories consist of glycerine. Medicinal suppositories may contain drugs such as morphia, cocaine, etc., and are chiefly used for the relief of rectal pain.

Rectal Bougies.—These are used to dilate a stricture, or to increase the lumen of the passage. This treatment is not as a rule entrusted to the nurse, but she must have everything in readiness. Rectal bougies are made of gum elastic and in varying sizes (1–12).

Requisites.—Table on the right-hand side of the patient and on it the following things: Bougies standing in a jug or dish of hot water, the blunt ends being uppermost; the water should cover three-quarters of the lower end of the bougie; lubricant, either olive oil or vaseline; swabs; receptacle for soiled bougies; mackintosh covered with a linen square; bowl of warm perchloride of mercury (1–2000) for the doctor's hands; rubber gloves or a caped finger-stall (Fig. 20).

Preparation.—The patient must have a simple enema (p. 62) administered beforehand to ensure the rectum being empty; the bladder should be emptied immediately before. Arrange the mackintosh and square in place when the patient is in position.

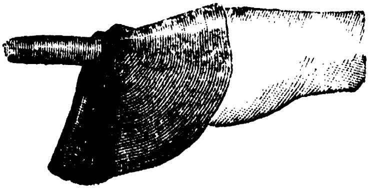


Fig. 20. Rubber caped finger-stall.

Position.—Left lateral (Fig. 251).

To cleanse bougies.—Wash thoroughly in hot water and soap; wash in perchloride of mercury (1–1000) and dry very carefully.

Oesophageal Bougies.—These are made in a variety of shapes, some being cylindrical, others flat. They consist of gum elastic or similar substance and range in sizes 1–24 (Fig. 21).

Requisites.—Table on the right-hand side of the patient and on it bougies standing in a jug of hot water, which should cover the upper half; lubricant, either glycerine or butter; swabs; mackintosh; bowl in case vomiting occurs; receptacle for the soiled bougies; tumbler of cold water.

Preparation.—The patient should have a light meal 4 hours previously and nothing afterwards.

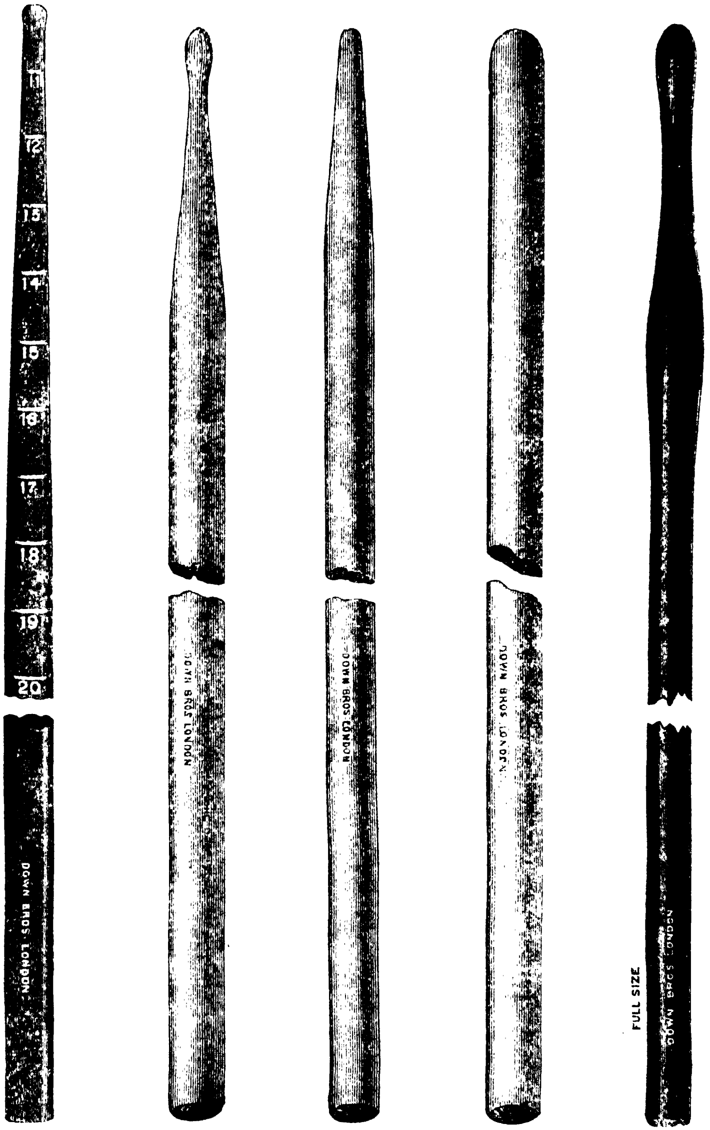
Position.—Sitting up.

Cleanse bougies as described under rectal bougies.

Lavage.—Consists in emptying the stomach and washing it out; emptying and washing out the rectum (p. 61), or washing out the bladder (p. 69).

Stomach Lavage.—*Requisites.*—Tray on the right-hand side of the patient containing apparatus in a bowl of hot water; lubricant, either glycerine or butter; two mackintoshes; large basin or small bath standing on a piece of linoleum or brown paper on the floor on the right-hand side of the bed; large jug of water or bicarbonate of soda solution ʒj–Oj, temperature 99° F., quantity 6 pints; litmus paper; receptacle for soiled tube.

Apparatus.—A stomach pump or an oesophageal tube joined (Fig. 22) by a glass connection to a long piece of rubber tubing with a funnel attached.



A. Flat. B. Bulbous. C. Conical. D. Cylindrical. E. Bellied bulbous, double ended.

FIG. 21. Five varieties of oesophageal bougies.

Position. — Sitting up or dorsal.

Method. — Stand on the right-hand side of the patient; place the mackintoshes in position so that the patient's clothing and the bed are protected; lubricate the tube and pass it through the mouth and oesophagus (see oesophageal feeding) into the stomach 14–16 inches from the teeth; place the funnel end of the tube in a bowl whilst passing the tube, or hold it up so that the contents of the stomach do not escape on to the bed. After passing the tube, lower the funnel end over the bed and allow the contents of the stomach to flow out; if there is any difficulty in starting the flow, pour an ounce or two of water down the funnel and lower it again. When the stomach is empty, raise the funnel and pour in Oj of water, lower the funnel again and allow the water to flow into the bath. Repeat this procedure until the water is returned clear. Having finished, compress and withdraw the tube. If the stomach contents are needed for examination, as for test meal, etc., no water must be used until the stomach has been emptied (see test meal, p. 31), the contents being received into a separate basin. The amount of fluid put in and the amount withdrawn must always be measured. Test the reaction of the evacuated contents of the stomach with litmus paper (see p. 35).

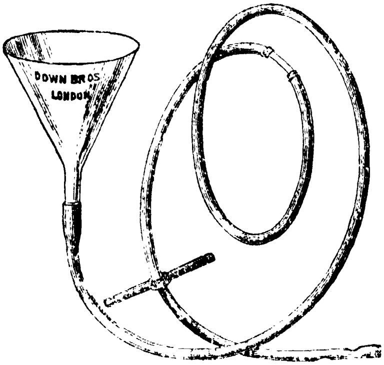


Fig. 22. Apparatus for stomach lavage.

Catheterization.—1. *Female catheter—Apparatus.*—Glass catheter (preferably a short one with rubber tubing attached) (Fig. 23) or a No. 8 soft rubber catheter.

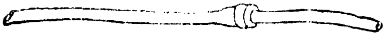


Fig. 23. Short glass female catheter with rubber tubing attached.

Requisites.—Tray on the right-hand side of the patient containing sterilized catheters, preferably two, in perchloride of mercury (1–2000); bowl of warm perchloride of mercury (1–2000) and swabs; bowl of carbolic (1–40) for the nurse's hands; porringer for the urine;

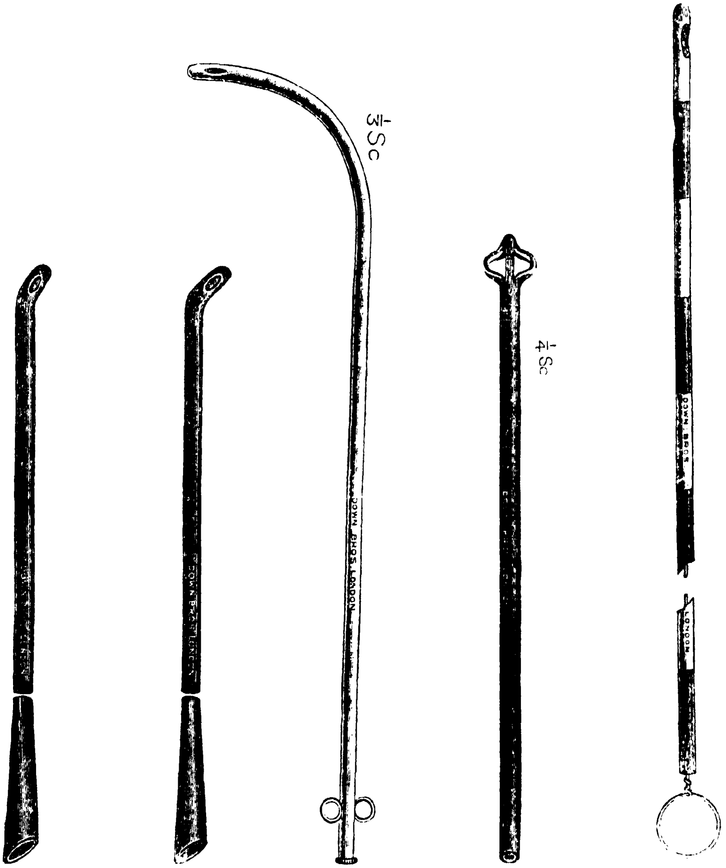
small receiver for soiled swabs and catheter; mackintosh and sterilized towel; hand lamp.

Position.—Dorsal, with the knees separated and slightly flexed.

Method.—Turn down the patient's bedclothes to her knees, leaving her covered with a small blanket reaching from chest to thighs; draw up the nightdress and place the mackintosh under the buttocks; arrange the porringer in position and the lamp so that the light shines where it is needed. Next, thoroughly wash and disinfect the hands and arms (nurse's), then turn back the blanket (use the elbow, or ask the patient to draw it up). Cleanse the vulva, then separate the labia with the first and second fingers of the left hand. With the right hand, swab the parts from above downwards with perchloride of mercury (1–2000), using the swab very wet; having cleansed the labia and orifices, place a clean swab over the meatus and another one in the orifice of the vagina. Next thoroughly disinfect the hands in the carbolic lotion, then place the towel in position. Take the catheter in the right hand, holding it away from the eye, and run the perchloride lotion over and through it. With the left hand separate the labia held apart by the swab, which will remove the swab, and pass the tip of the catheter straight into the meatus, taking care that it touches nothing before entering. The free end of the tubing should be placed over or in the porringer before introducing the catheter. When using a long glass catheter close the tip with one finger whilst introducing and removing it. When the catheter has been inserted for about 3 inches, urine will begin to flow. The left hand may now be removed from the labia and the patient may be covered with the blanket for a few minutes. When the urine ceases to flow, withdraw the catheter a little; this will cause the urine to flow again; when it ceases, press gently over the bladder (except when there is a wound in the vicinity) and ask the patient to cough; this ensures the bladder being empty. If no more urine flows, withdraw the catheter, keeping the eye tilted upwards so that it does not drip; remove the vaginal swab, swab the labia and vulva, and leave the patient dry and comfortable.

Should the catheter be introduced into the vagina by mistake, the second one must be used, or, if this is not provided, it will be necessary to wait until the catheter has been cleansed and re-sterilized (p. 43). The nurse must also re-purify her hands. Placing a swab in the vagina prevents this occurring. Measure the urine and put up a specimen.

Dangers.—Cystitis (p. 245); catheter fever (p. 246); retention of urine (p. 238). Cystitis occurring in cases as a result of catheterization is unjustifiable. It cannot be too strongly emphasized that lack of surgical cleanliness and inattention to detail of the technique described above result in cystitis, which may have serious and lasting effects on the patient's health.



A. Semi coudé. B. Coudé. C. Prostatic. D. Self-retaining. E. Ureter.

FIG. 24. **Catheters.**

2. *Male catheter* (Fig. 24)—*Requisites.*—Table at the right-hand side of the patient with catheters previously sterilized and placed in a dish of sterilized boracic; sterilized glycerine or paroleine, or

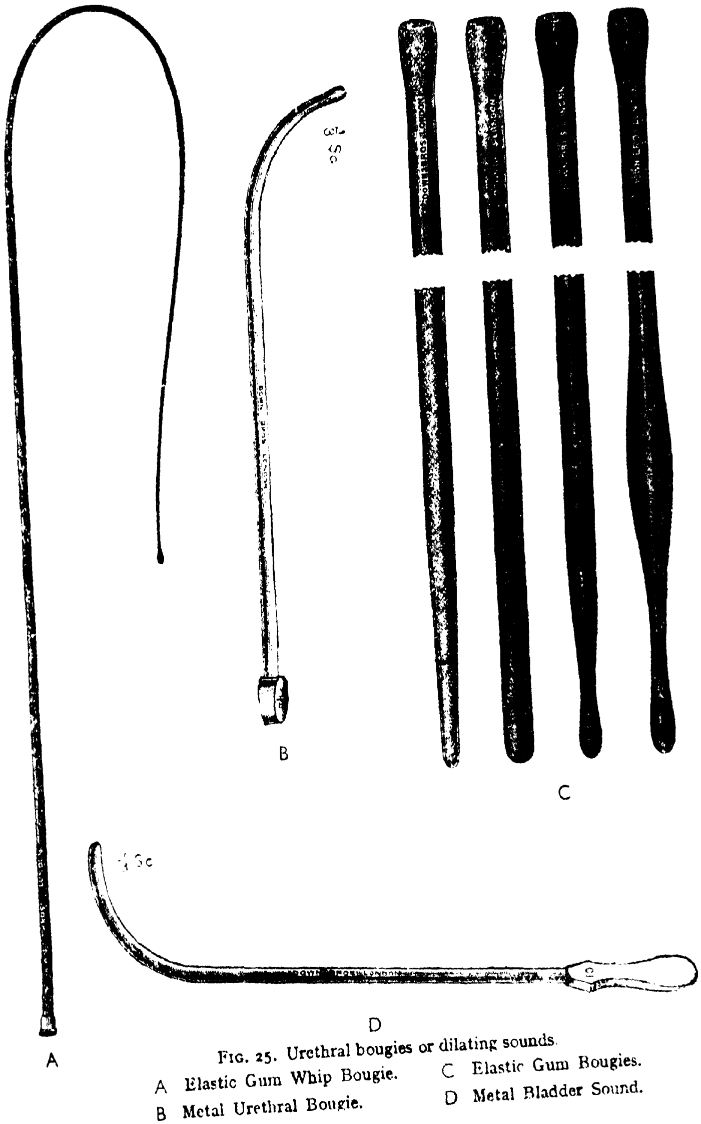


FIG. 25. Urethral bougies or dilating sounds.

A Elastic Gum Whip Bougie.

B Metal Urethral Bougie.

C Elastic Gum Bougies.

D Metal Bladder Sound.

tube of carbolic vaseline; bowl of carbolic (1–20); bowl of warm sterilized boracic, swabs; porringer for the urine; small receiver for the soiled swabs; mackintosh and sterilized towel.

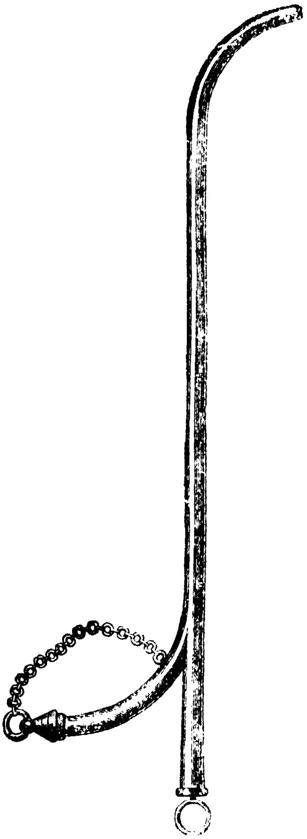


FIG. 26. Double-channel catheter for bladder lavage.

The passing of the male catheter is not included in the duties of a nurse except in rare cases or in an emergency. Should it however be necessary, the same technique is necessary as for passing a female catheter (p. 66).

Position.—Dorsal.

Method.—Cleanse the penis with carbolic lotion followed by boracic, gently push back the foreskin and cleanse the glans and the meatus. Lubricate a soft rubber catheter and pass it into the meatus, holding the penis up rather more than half-way between the horizontal and the perpendicular, and push the catheter gently onwards. Force must on no account be used; if resistance is met with, hold the catheter in position for a short time and again gently push it forwards; it will then, in ordinary conditions, slip into the bladder.

Dangers.—Catheter fever (p. 246); cystitis (p. 245); retention of urine (p. 238)

Ureteric catheterization, see p. 492.

Urethral Bougies and Sounds (Fig. 25).—*Requisites.*—As for catheterization, with the addition of the bougies, which, after sterilization, are placed in sterilized boracic. A *Sound* is used to *feel, sound* or *explore* the interior of the bladder, has a bulbous end, and is not graduated in size (Fig. 25D).

A *Bougie* (Fig. 25B) or dilating sound is used to dilate, or overcome a stricture in the urethra, the passage into the bladder, and is of graduated thickness, marked in figures on the flat disc at the end, i.e. 1–3, denoting the smallest and largest circumference of that bougie.

Bladder Wash-out, Irrigation, or Lavage.—*Apparatus.*—Double-channel catheter (Fig. 26), to each arm of which rubber tubing with glass connection is attached; glass funnel; rubber catheter No. 8.

Requisites.—Table on the right-hand side of the patient with the sterilized apparatus in a bowl of sterile boracic; catheter requisites; clip forceps; measure jug containing the solution to be injected standing in a bowl of warm water; large bowl or pail standing on a piece of linoleum on the floor at the right-hand side of the bed.

Position.—Dorsal, with the knees separated and slightly flexed.

Method.—The same technique as that described under catheterization is employed. If a double-channel catheter is used, first pass the rubber catheter to empty the bladder. Fill the double-channel catheter and 'inlet' tubing with the lotion and clamp it, after expelling the air; clamp the outlet tube and place the end in the receptacle on the floor. Pass the catheter; then release the inlet clamp and allow about 4 to 6 ounces of the lotion to flow into the bladder; then unclamp the outlet tube and allow the lotion to flow into the pail; continue until 2 pints of lotion have been used or the lotion is returned clear. When the double-channel catheter is not used, pass the rubber catheter; fill the funnel and tubing with the lotion and clamp the tube, after expelling the air; connect the tube to the rubber catheter when the urine has ceased flowing; release the clip and allow 4 to 6 ounces of lotion to flow into the bladder; invert the funnel over the receptacle on the floor and allow the fluid to return; compress the tube; raise the funnel and refill with lotion; expel the air and allow the lotion to flow into the bladder. Repeat the procedure until the fluid is returned clear, using at least 2 pints of lotion. The funnel must only be raised sufficiently to allow of a gentle stream entering the bladder. When finished, withdraw the catheter as described under catheter (p. 66).

Solutions used for bladder washing are: Half-strength sterilized boracic lotion; salt solution; permanganate of potash (pink). The temperature of the lotion should be 100° F.

For the cleansing of catheters see Chapter II, p. 43.

Vaginal Douche.—*Apparatus.*—Douche can with tubing attached (Fig. 27), fitted with a stopcock or clip forceps. Glass vaginal nozzle; rubber tubing with glass connection attached.

Requisites.—Tray on a table on the right-hand side of the patient with the douche can filled with lotion at the correct temperature; the sterilized nozzle and the tubing attached to the glass connection placed in a bowl of carbolic (1–20); bowl of warm perchloride of mercury (1–2000) and swabs; small bath, bidet, or bedpan (Fig. 3).

1. *Position.*—Left lateral with the buttocks well over the edge of the bed.

Method.—Turn down the bedclothes, leaving the patient covered as much as possible with a small blanket; draw up the nightdress to the waist; roll one end of the mackintosh so as to form a trough and place it under the buttocks in such a manner that the rolled-up portion is beyond that part of the bed on which the patient is resting; this will prevent the lotion running into the bed. The remainder of the mackintosh hangs over the side of the bed into the bath placed immediately beneath. Next wash and purify the hands and arms (see nurse's hands, p. 46); attach the nozzle to the tubing fitted with a glass connection and connect it to the tubing on the douche can (the tubing attached to the douche can, unless sterile, must be held in a swab). Allow 1 or 2 ounces of the lotion from the douche can to run through, then re-clamp the tube and leave the sterilized portion with the nozzle in the bowl of carbolic lotion. With the left hand raise the patient's right buttock; with the other hand cleanse the vulva with a swab wet with perchloride lotion (1–2000). After disinfecting the hands, take the nozzle in the right hand and, after rinsing it in the perchloride lotion, pass it into the vagina in a backward and upward direction for about three inches. Release the clamp and allow the lotion to flow; tilt the patient a little backwards to ensure the lotion running into the bath. When finished, clip the tube and withdraw the nozzle; place the hand over the pubic region and ask the patient to cough; this will empty the vagina. Swab and dry the vulva; remove the mackintosh and leave the patient dry and comfortable. If given correctly the bed will not be wet. This method of douching is used in all cases allowed to turn on their side, and is the most satisfactory for inspection of the vulva and for ascertaining the amount of discharge. Two quarts of lotion should be used.

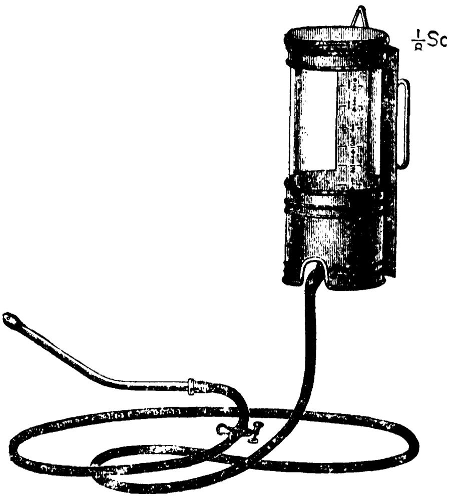


FIG. 27. Douche can with tubing, clip, and glass vaginal douche nozzle.

2. *Method used when the patient is unable to turn.—Position.—* Dorsal, recumbent, no pillows allowed.

The technique is that already described. After removing the patient's pillows, place the mackintosh under the buttocks and raise the patient on to a bidet, bedpan, or douche pan (the 'perfection' bedpan is a useful one for this purpose, see Fig. 3). Proceed as described above. It is important that the pillows should be removed in order to have the patient's pelvis higher than her shoulders, otherwise the lotion only reaches the entrance of the vagina.

Drugs used for vaginal douching.—Lysol 1 per cent; perchloride of mercury 1–4000; iodine ʒj–Oj.

The temperature of the lotion should be, for ordinary purposes, 105° F.; for rigid soft parts, 105°–115° F.; for checking haemorrhage, 120°–130° F. or as hot as it can be borne, the external parts having been previously smeared with vaseline.

Intra-uterine Douche.—This douche is not usually administered by the nurse.

Apparatus.—Douche can and tubing; intra-uterine tube, which is made with a groove down one side to allow of the return of the lotion (Fig. 28).

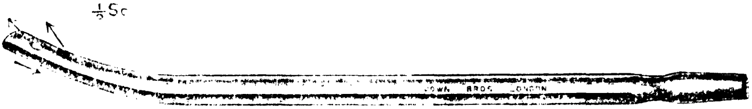


FIG. 28. Glass intra-uterine nozzle.

Requisites.—The same as described for vaginal douche.

Position.—Left lateral (p. 677), with the buttocks well over the side of the bed.

Method.—A vaginal douche is first given to cleanse the vagina. The intra-uterine tube is then passed through the cervix into the uterus. The lotion is only allowed to flow in very gently, otherwise the fluid may be forced through the Fallopian tubes into the peritoneum. When finished, the tube is removed and the patient arranged as described under vaginal douche (p. 71).

Drugs used.—Perchloride of mercury 1–5000—1–10,000; normal saline solution; Lysol ½ per cent; iodine ʒj–Oj.

Temperature of douche, 100°–105° F.; for haemorrhage, 115°–130° F.

Nurses should remember that it is possible to scald or poison a patient with a douche improperly prepared. The douche should always, therefore, be mixed in a separate measure jug, and the temperature tested before it is emptied into the douche can. The lotion must be measured in every case, never guessed. The doctor orders the drug that is to be used, also its strength, except in midwifery cases, where the midwife uses the antiseptic lotion she prefers. In connection with these patients it must be remembered that some have idiosyncrasies as regards drugs and cannot tolerate certain lotions. This, as a rule, can only be discovered after the use of the drug. Any symptom of intolerancy after the use of perchloride of mercury, carbolic, iodine, or Lysol will necessitate discontinuing the drug and substituting saline solution until a doctor's advice has been procured.

For symptoms of intolerancy of drugs see Chapter XXVII, p. 770.

Intravenous Infusion and Transfusion of Blood and its Derivatives

Intravenous Infusion.—*Method* 1.—Closed method of administering intravenous solutions and for blood transfusion by McCartney's bottles.

During recent years the discovery of the value of various solutions for intravenous injection has rendered this form of treatment prominent. McCartney's method by means of screw-capped bottles avoids contamination, and simplifies preparation and administration.

Apparatus required (Fig. 29).—(*a*) Intravenous solution in screw-capped bottle.

(*b*) Metal screw fitting for bottle.

(*c*) Metal carrier for bottle.

(*d*) Three pieces of rubber tubing of 5-mm. bore: (i) to reach bottom of bottle D. This is tied with ligature silk to the metal fitting at B and the free end notched as in sketch; (ii) small piece E two inches long attached to side arm C; (iii) a long piece F attached to the bent arm of the fitting at A, furnished with bubble trap H, a clamp J, and an adaptor K for the needle; needle.

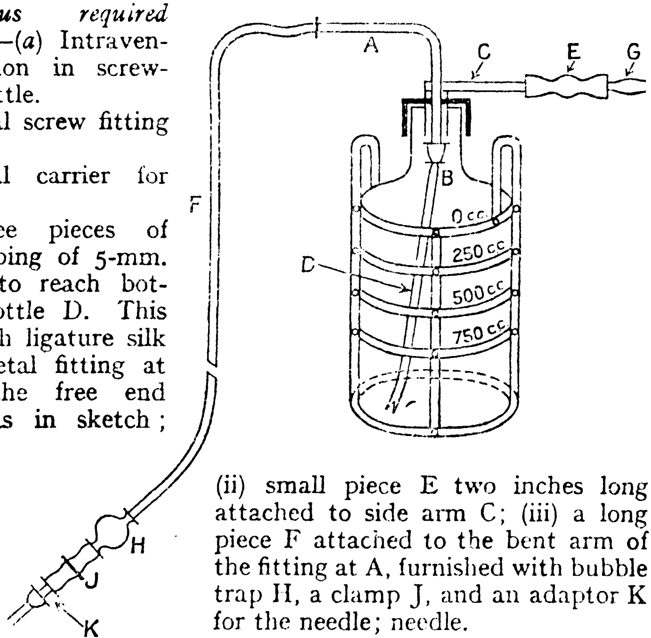


FIG. 29. Apparatus for administering fluids intravenously.

(*e*) Sterile air filter G, consisting

of a piece of 5-inch glass tubing containing cotton wool and drawn to a point at each end.

(*f*) Ampoule file.

(*g*) Rubber blow ball.

The metal carriers for the bottles are designed so that the rings indicate the amount of fluid taken from the bottle.

Method.—Place the bottle of intravenous fluid in the holder and immerse in warm water. The metal fitting, with rubber tubing, bubble trap, clamp, and adaptor attached is sterilized by boiling. Remove the viskap (the cap which is on the bottle when autoclaved sealing it), unscrew the cap from the bottle, insert the rubber tube D and screw on the metal fitting. File and break off the pointed ends of the air filter G, and insert one end into the rubber tubing E. Attach the blow ball to the free end of the air filter G. Hold the tube F vertical, release the clamp J, blow air into the bottle until the fluid issues from the adaptor K. Close the clamp, lower the tube F and remove the blow ball. The fluid is now ready for administration as Fig. 29, and during the injection siphons over from the bottle, the pressure depending on the height of the bottle above the patient.

2. *Open Method.*—*Emergency Apparatus* (Fig. 30).—Glass cannula attached to a piece of tubing ½ yard in length, joined by a glass connection to a piece of tubing with a glass funnel attached.

Instruments.—Small scalpel, dissecting forceps, artery forceps, aneurysm needle, scissors, strong silk for ligatures, curved needle and sutures for the skin, or a serum syringe with needle (p. 86).

Requisites.—The following things should be placed on a table covered with a sterilized towel and placed at the same side as the arm chosen for infusion: Sterilized instruments in a dish containing spirit; the apparatus sterilized and placed in a dish of warm saline solution and covered with a sterile towel; iodine for purification; dressing, gauze, wool, and roller bandages; purified measure for the saline; hot and cold sterilized saline solution in flasks; bowl of warm perchloride of mercury (1–2000) and swabs; mackintosh and sterilized towels; receiver for soiled swabs.

Method.—The vein usually selected is the median basilic at the bend of the elbow. The arm is purified and a bandage is applied tightly around the upper arm to cause the vein to become distended and prominent. The mackintosh and towels are next arranged. The surgeon then makes an incision in the tissues over the vein; the aneurysm needle threaded with silk, the two ends of which are of the same length, is passed under the vein; the silk is divided close to the needle. The lowest ligature next to the forearm is then tied, the second piece of silk being left in position about ½ inch above it. The apparatus is filled with saline at a temperature of 105° F.; the air is expelled and the tubing clamped. The vein is then opened, the clamp on the tube released, and the cannula introduced into the vein with the saline flowing to preclude the possibility of introducing air. The second ligature is then tied over the cannula in one knot only. The bandage on the arm having been removed, the saline is allowed to run in slowly until the required quantity has been given, usually Oj; the tube is then clamped, the cannula withdrawn, and the ligature firmly tied above the incision in the vein. The skin incision is stitched and the dressing applied.

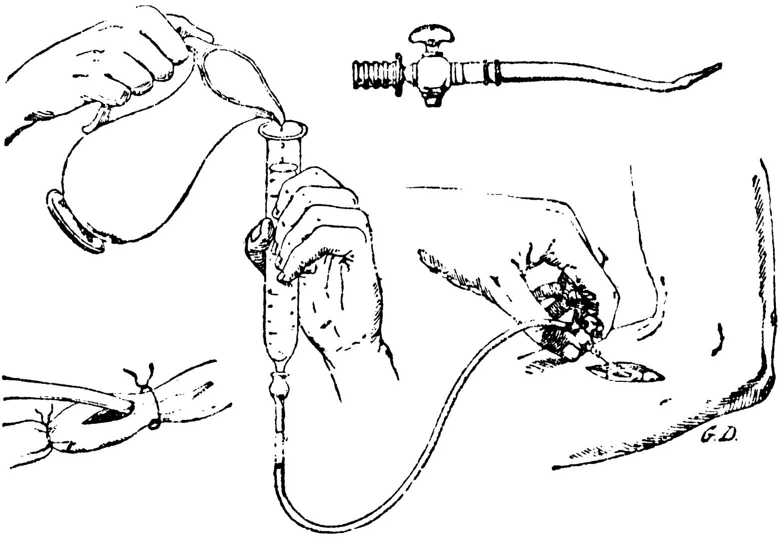


FIG. 30. INFUSION INTO VEIN OF FOREARM.

Above, a useful form of cannula is represented; below, the arrangement of the ligatures on the vein.

The cannula and tubing must be absolutely full of saline and free from air bubbles before being introduced, otherwise an air embolism (p. 282) may result. Strict aseptic precautions are necessary or the blood stream may be infected (p. 575).

Intravenous Injections.—Drugs may be given intravenously, and the procedure is that already described, with the exception that a needle is used instead of a glass cannula; the needle is inserted into the vein through the skin without making an incision. Saline may also be given in this way.

Blood Transfusion.—Blood transfusion means the transfer of blood from one person into the circulation of another person in order to combat anaemia produced by disease or haemorrhage. Before performing this operation care has to be taken that the two bloods are matched, because the mixing of unmatched blood may be followed by clumping of the red blood corpuscles owing to the presence of agglutinating substances. These agglutinating substances are present in both the serum and the red blood corpuscles. It has been found that there are two in the serum, called α and β (Alpha and Beta) agglutinins; and two in the red cells, called A and B agglutinogens. According to the distribution of these substances human blood is classified into four groups, identified by the agglutinogens they contain.

When A and B agglutinogens are present, but no agglutinins, we get Group AB (Landsteiner's classification) or Group I (Moss's classification). When A agglutinogen and β agglutinin, Group A or Group II. When B agglutinogen and α agglutinin, Group B or Group III. When no agglutinogen and α and β agglutinins, Group O or Group IV.

Group AB can receive from any of the groups since its serum contains no agglutinins; such persons are called *universal recipients.*

Group O can give blood to all other groups since its cells contain no agglutinins; such persons are called *universal donors.*

Group A can receive from its own group or from Group O, and Group B from its own group or from Group O.

Rh grouping. Another factor has recently been found in red cells which under certain circumstances may necessitate the carrying out of a special type of grouping. This is known as the *Rh factor,* so called because it was found that an anti-serum, prepared by injecting rabbits with the red cells of the Rhesus monkey, has the property of agglutinating 85 per cent of human red cells, which were in consequence called *Rh positive,* while the remaining 15 per cent which are not agglutinated are called *Rh negative.* It is important to determine the Rh grouping before transfusing cases during pregnancy or the puerperium, as well as individuals who are going to receive many transfusions.

Recently transfusions of only one element have been introduced for the treatment of various diseases; thus in haemorrhage red cells only might be given, whilst in shock, where there is great concentration of blood, it has been found better to give only plasma or serum in order to dilute the blood. When giving packed red cells, either cells of the same group or from Group O donors are given. For serum or plasma it is best to give from the same group or from Group AB.

Uses of Blood Transfusion.

1. Haemorrhage, (*a*) following operation or accident; (*b*) in haematemesis; (*c*) in haemoptysis.
2. In pernicious anaemia.
3. In pre-operative anaemia. Especially useful in cases of abdominal carcinoma and in gynaecological cases.
4. During operation. Blood may be replaced as the patient loses it.
5. In shock following extensive burns transfusion of serum is given while blood is unsatisfactory, as the shock is due to loss of blood plasma into the tissues, causing the blood to become concentrated. (See burns, p. 521.)
6. In toxic and septic conditions.

Blood withdrawal.—Blood is obtained by the closed method from a ***donor*** who must be healthy and give a negative Wasserman reaction, and whose blood has been examined (grouped) to see that it is compatible with that of the ***recipient***. Blood may also be withdrawn for storage.

Stored Blood.—Blood is stored for the emergency treatment of casualties. When withdrawn it is added to an anticoagulant solution, for example, 3 per cent sodium citrate and 1 per cent glucose; it may be used after as much as one month's storage without harmful effects, but it is better given within a week.

Method.—McCartney's bottle. The blood is withdrawn into a screw-capped bottle containing sodium citrate solution to prevent clotting. When the required amount of blood has been obtained it is administered intravenously, as described on p. 81.

Apparatus for withdrawing Blood.—(*a*) 40-oz. screw-capped bottle containing 75 c.c. of 3·8 per cent sodium citrate in Ringer solution (sterilized).

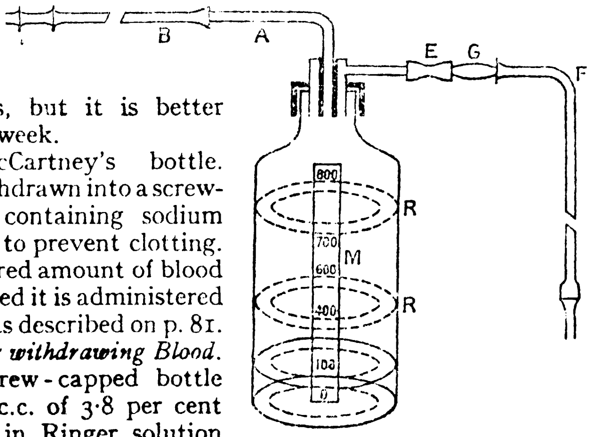


FIG. 31. Apparatus for withdrawing blood for blood transfusion.

(*b*) Screw-capped fitting, fitted as in Fig. 31. To the bent arm is attached a short piece of rubber tubing B, fitted with adaptor and wide-bore needle.

(*c*) Gauge M, for estimating amount of blood, marked to indicate 100-c.c. amounts in the bottle.

(*d*) Air filter A.

(*e*) Piece of rubber tubing F, 18 inches long, with glass mouthpiece.

(*f*) Two rubber bands R, ⅜ inch wide.

Requisites.—Two or three pairs of Spencer Wells artery forceps, one pair of fixation forceps (toothed dissecting forceps), one pair of dissecting forceps, one pair of pointed scissors, one aneurysm needle, towel clips. In spirit: one scalpel, hypodermic syringe and needles, tube of catgut and file. Local anaesthetic, novocaine 1 per cent. Iodine or spirit for cleansing the skin, sphygmomanometer. A pint of tea or strong coffee, well sweetened, for the donor afterwards.

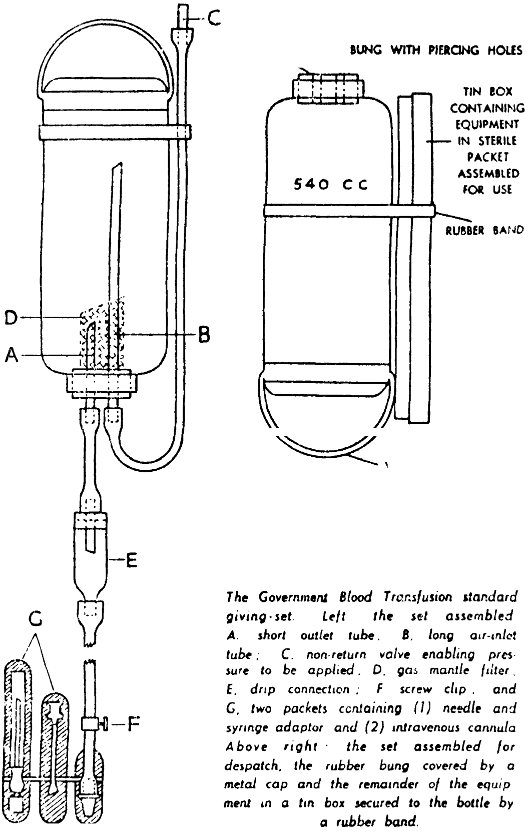
Apparatus for administering blood.—(*a*) Screw cap fitted as in Fig. 29; (*b*) sterile air filter.

Method.—The rubber tubing B (Fig. 31), adaptor and needle are lined with liquid paraffin and attached to the bent arm A of the screw fitting. The short piece of rubber tubing E is attached to the side arm. (These are then wrapped in Kraft paper and autoclaved.) The bottle and contents are warmed, the cap of the bottle removed and the screw fitting applied; the tips of the air filter are filed and broken off. One end is inserted into the tube E and the other into the long tubing F (Fig. 31) carrying a mouthpiece. The needle is inserted into the vein of the donor, and gentle suction applied with the mouth. Blood pours from the lower part of the tube A into the bottle, and its rate of flow is observed. As the blood flows in, the bottle is gently rotated to mix its contents, the amount read on the gauge. When enough blood has been obtained and the needle withdrawn, the gauge and rubber bands are removed and the bottle fitted into the wire carrier as in Fig. 29, and placed in warm water. The screw fitting as in Fig. 31 is removed, and the screw fitting as in Fig. 29, with rubber tubing attached and already sterilized, is substituted. The blood is administered to the patient as if it were the intravenous solutions previously described (p. 74).

Blood Transfusion.—Many different types of transfusion apparatus are in use, the one here described is commonly used—the Government blood transfusion standard giving set—shown assembled in Fig. 32.

Apparatus.—Blood transfusion set (Fig 32), with equipment in sterile packet, containing needle, syringe, adaptor, and intravenous cannula.

Transfusion Trolley Setting.—Dressing mackintosh, sterile towels, clips, swabs, dry gauze, wool, bandage, adhesive plaster, collodion; soft pillow for the limb, padded straight splint; sphygmomanometer to act as tourniquet; spirit for cleansing the skin; hypodermic tray with syringes, adrenalin, and 2 per cent novocaine.


C
BUNG WITH PIERCING HOLES
TIN BOX CONTAINING EQUIPMENT IN STERILE PACKET ASSEMBLED FOR USE
540 CC
RUBBER BAND
D
A
B
E
C
F

The Government Blood Transfusion standard giving-set. Left the set assembled A. short outlet tube. B. long air-inlet tube; C. non-return valve enabling pressure to be applied. D. gas mantle filter. E. drip connection; F screw clip. and G. two packets containing (1) needle and syringe adaptor and (2) intravenous cannula Above right · the set assembled for despatch, the rubber bung covered by a metal cap and the remainder of the equipment in a tin box secured to the bottle by a rubber band.

FIG. 32.

Sterile instruments in spirit.—Small scalpel, 1 pair rat-toothed dissecting forceps, 2 pairs dissecting forceps, 1 pair small sharp-pointed scissors, aneurysm needle, catgut, several pairs of Spencer Wells artery forceps, skin needle, and suture, fine rubber tubing for vein.

Technique.—In order to give the patient free movement of his arm a vein in the middle of the forearm is selected, or the internal saphenous vein in front of the ankle may be preferable. The transfusion is given by gravity. A 3-4-foot head of pressure, measured from the upper level of the blood (not from the drip feed) to the point of insertion of the needle or cannula, is usually sufficient. Before infusion the blood is warmed by immersing the bottle in water, temperature 104° F., for 15 minutes. During the infusion it may be prevented from becoming cold by submerging a coil of the delivery tube in water of the same temperature. After arranging dressing mackintosh and towels a sphygmomanometer cuff is applied to the patient's limb and inflated. The skin is cleaned with spirit. The operator then passes the needle through the skin into the vein, the sphygmomanometer cuff is deflated and the transfusion begins. The tubing is then fastened by strapping to the limb. When it is not possible to enter the vein through the skin the vein is exposed by cutting down as described on p. 75. The rubber tubing is passed beneath the vein, to keep it exposed, the vein is opened, and the cannula introduced, the rubber tubing is then removed, the tourniquet released. Sterile gauze and wool are bandaged over the wound firmly below and loosely above, and the flow is started. The limb may be steadied on the splint and rests on the soft pillow.

Nurse's duties.—Drip feeds are usual in modern apparatus, and the nurse should be able to adjust the rate of flow to that ordered by the doctor. About 20 drops correspond to 1 c.c. of blood, and therefore 1 drop per second equals approximately 180 c.c. per hour, or 1 pint of blood in 3 hours. Any pain or untoward symptom is reported at once.

Cleansing.—After use the apparatus is taken down and *immediately* cleaned by running *cold* water through until quite clear. It is then returned to the laboratory or sterilizing room for final cleaning and sterilization.

Complications and Dangers of Blood Transfusion.

(*a*) Air embolism. See p. 282.

(*b*) Jaundice unassociated with urgent symptoms is sometimes present for a few days following transfusion of a large volume of blood if stored blood has been used, but it is unimportant and passes off without treatment. Minor rises in temperature or even rigors are common, and are treated as described for rigor on p. 207. Imperfect cleansing of the apparatus is often responsible.

(*c*) *Heart failure* from too rapid transfusion. Symptoms are restlessness, cyanosis, rapid weak pulse, pain in the chest, and possibly expectoration of frothy sputum.

(*d*) *Transfusion of incompatible blood* (p. 77.) The symptoms and signs include backache, feeling of oppression in the chest, and possibly a bursting feeling in the head. *Urgent signs* are vomiting and collapse, with a rapid pulse, indicating something is wrong, and the transfusion is stopped at once, by the nurse herself if the doctor is not present. Later jaundice, haemoglobinuria, followed by oliguria or anuria, may occur.

Treatment consists in giving abundant fluids and large quantities of alkalis by mouth, or if necessary intravenously.

(*e*) *Intravascular clotting.*

Venesection or Bleeding (Fig. 33).—*Apparatus.*—Scalpel, dissecting forceps, artery forceps, needle, and sutures.

Requisites.—Table on the same side as the arm chosen for operation; sterilized instruments in a dish containing carbolic (1–40), iodine for purification; dressings, gauze and wool, roller bandages; purified measure porringer to receive the blood; bowl of warm perchloride of mercury (1–2000) and swabs; mackintoshes and sterilized towels; receiver for soiled dressings.

Method.—If the median basilic vein is the one chosen, the arm is tightly bandaged about the middle of the upper arm. The area of operation is purified with iodine or otherwise (p. 437), the patient is given a firmly rolled bandage to grasp, and the mackintoshes are arranged so as to protect the bed. The nurse will be required to hold the patient's arm; this she should do standing on the opposite side of the bed and grasping the arm about the middle of the upper arm and forearm. After placing the sterilized towel in position, the surgeon opens the vein, the bandage on the upper arm is released, and the blood is allowed to flow into the porringer until the required amount has been withdrawn, usually about ℥x. A stitch is then put in the skin, and a firm pad and bandage applied to the wound. Small quantities of blood may be withdrawn by ***vein puncture*** (see p. 120). Venesection may either precede or follow intravenous infusion (p. 74).

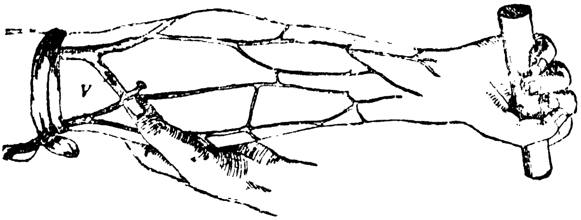


FIG. 33. Venesection.

From 'A Manual of Surgery,' by Rose and Carless.

Hypodermoclysis or Subcutaneous Infusion.—May be administered in three different ways:

1. By tubing, funnel, Y connection, and two needles (Fig. 34).

2. For continuous saline infusion, the apparatus required consists of a vacuum saline flask fitted with rubber tubing, clamp, drip bulb, tubing, Y connection, and two needles (Fig. 17).

3. For children, saline may be injected slowly from a Record serum syringe with one needle (Fig. 37).

Apparatus.—Two large needles with about six inches of rubber tubing attached to each which are joined to a glass forked connection with a thermometer inset; the glass connection is connected to a long piece of tubing with a glass funnel attached.

Requisites.—Small table on the right-hand side of the patient with sterilized apparatus in warm boiled water; clip forceps; hot and cold sterilized saline solution in flasks; sterilized measure jug; carbolic lotion with swabs or iodine for purification; dry wool, collodion; mackintosh; sterilized towels.

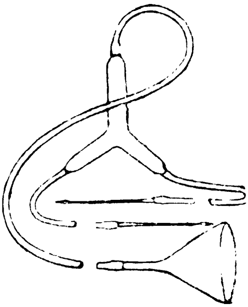


FIG. 34. Apparatus for subcutaneous infusion.

Method.—Uncover the part selected for infusion either below the breast or the flanks, and arrange the mackintosh in position. Care must be taken not to expose the patient unnecessarily; these patients are invariably suffering from shock (p. 561) which is increased by undue exposure. The part selected for puncture is purified and covered with a sterile swab. After rendering the hands sterile (p. 46), place the towels in position. Fill the funnel and tubing with the saline solution at a temperature of 105° F.; allow the fluid to run through the needles, and after expelling the air, clamp the tube above the glass connection which must be full and free of air bubbles. Remove the swabs and insert the needles one on either side.

To insert the needles pinch up a fold of skin and run the needles into the lower part sharply and deeply. Unclamp the tube and allow the solution to run in. When the fluid ceases to flow, if the required amount has not been given, move the needles in a little more deeply, or alter the direction of them; this will cause the fluid to flow again. Moving the needles is painless when the points are surrounded with fluid. When the prescribed amount has been injected, clamp the tube, withdraw the needles, and seal the punctures with dry wool and collodion (p. 441).

Dangers.—Surgical emphysema (p. 412) due to introducing air; sepsis (p. 569); sloughing of the skin (p. 518) due to injecting the fluid too superficially.

Hypodermic Injections.—*Apparatus.*—Hypodermic syringe and needles (Fig. 35).

Requisites.—Carbolic (1–20); alcohol; drug to be administered; swab soaked in alcohol or iodine for purification.

Method.—Sterilize the syringe and needle by drawing through them carbolic (1–20), then alcohol; thoroughly empty the syringe, then draw up the fluid to be injected, taking rather more than the required injection into the syringe; expel the air by keeping the point of the needle upwards whilst pushing the piston until the needle is full of fluid. Next turn the screw on the piston until the required dose is indicated in minims on the piston rod between the barrel and the screw. This will leave some fluid in the syringe beyond the required dose, but, provided the screw is in correct position, only the quantity indicated between the barrel and the screw will be injected. Cover the needle in a swab soaked in alcohol. Another way is to draw up the exact quantity required, which is injected after expelling the air; of the two methods this is the least exact. If tablets containing the required dose are used, they must previously be dissolved in sterile water, unless a special syringe is used. In the latter case, when the tablet is placed in the syringe, a vacuum is created after drawing up sterilized water and the tablet dissolves.

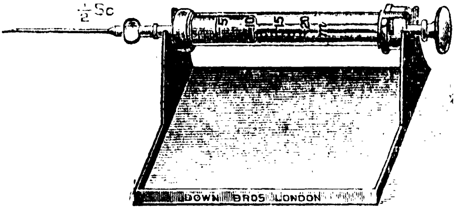


FIG. 35. Hypodermic syringe with rack.

Select a fleshy part of the arm or leg clear of veins and, after purifying the skin with the swab, pinch up a portion of it and introduce the needle sharply into the lower part of the raised skin. Release the skin and inject the dose, withdraw the needle and hold a swab firmly over the puncture for a few seconds to prevent the fluid returning. After measuring the dose and before injecting it, it should be checked by a second person.

To cleanse the syringe, release the screw, take off the needle, and empty the syringe; after re-attaching the needle, draw carbolic (1–20), then alcohol, through the needle into the syringe. After drying, detach the needle and thread the wire through before putting it away. The needle may be sterilized by boiling over a spirit lamp if preferred, and all glass syringes may be sterilized by boiling, but those with washers are ruined by being boiled. In hospital wards, or when the syringe is in constant use, the syringe and needles may be kept in alcohol in a glass-stoppered jar after they have been rendered sterile; they are then ready for immediate use. When injecting ether or brandy, the needle should be plunged deeply into muscle instead of being given subcutaneously.

Intramuscular Injection.—After cleansing the skin, the drug, or serum is injected deeply into the muscle—suitable sites are: the buttock, outer aspect of the thigh, flank or shoulder. The apparatus required is as for hypodermic injection but a large syringe is needed, a serum, or Record syringe. After the injection the puncture is sealed with collodion and a wisp of cotton wool. The phial containing the serum should be warmed before injection by standing in hot water for 10 minutes.

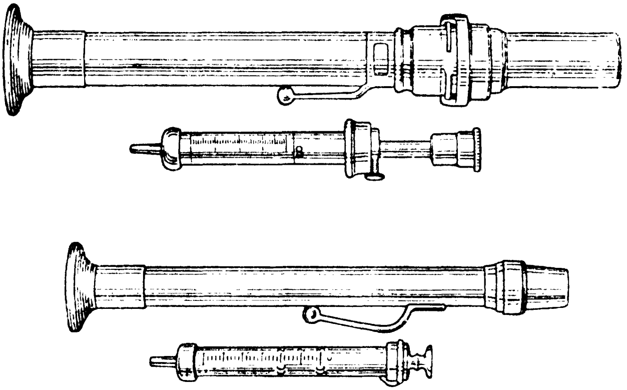


FIG. 36. **Bencard's insulin syringe with spirit-proof case.**

Intracutaneous Injection.—This method is seldom used for the administration of drugs but may be used to produce local anaesthesia (p. 444), also in the administration of toxin and antitoxin in certain pathological tests, i.e. Schick and Dick tests.

A very fine flexible and long needle is required as the drug is injected into the *substance of the skin*, not beneath it, the other requisites are those already given.

Intraperitoneal Injection.—The apparatus required is as for muscular injection. This method is found to be valuable in the administration of saline to infants (see p. 76), and is also used for administering serum, the serum being absorbed more rapidly than when given intramuscularly, being almost as rapidly effective and with less possibility of complications than when the intravenous method is used.

Insulin.—*The Measurement of Insulin.*—Insulin is supplied in

5 c.c. vials with rubber tops in three different strengths of solution, containing 20, 40, and 80 units per c.c., and called respectively single, double, and quadruple strength insulin.

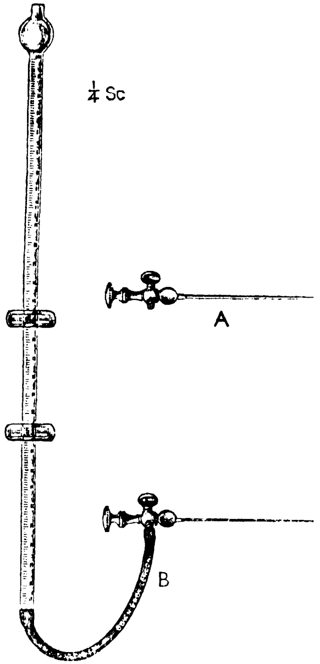


FIG. 37. Greenfield's manometer.

Apparatus.—Hypodermic syringe marked in c.c.; medium size needles to fit (Fig. 35); or special insulin syringe (Fig. 35) always ready for use in spirit container.

Requisites. — Alcohol; iodine; cotton-wool swabs.

Method.—Sterilize the needle and syringe by boiling; cleanse the top of the rubber cap with alcohol; draw air into the syringe equal to the dose to be given; insert the needle through the rubber cap, invert the ampoule and expel the air into the ampoule and then withdraw the required dose. Rub the skin at the site of injection with alcohol or iodine and inject subcutaneously, not intramuscularly.

N.B.—Care is required that only the correct dose is withdrawn as insulin is very expensive.

Antitoxins are injected with a larger syringe which is previously sterilized by boiling (Fig. 37). The injection is given deeply into muscle, the abdomen or buttocks being favourable sites. The puncture is sealed with dry wool and collodion.

Lumbar Puncture.—*Apparatus.*—Barker's lumbar puncture needle (Fig. 38); Greenfield's lumbar puncture needle (A), with side attachment (B), for manometer (Fig. 37), placed in alcohol after sterilization.

FIG. 38. Barker's lumbar puncture needle.

Requisites.—Iodine two per cent in spirit; two sterile culture tubes; sterilized glass measure to receive the fluid; bowl of warm perchloride of mercury (1–2000) and swabs; wool and collodion for dressing; mackintosh and sterilized towels; receiver for soiled swabs;

ethyl chloride spray (see Fig. 186); hypodermic syringe with novocaine solution one or two per cent; sal volatile, measure, and water.

Position.—Lying on the side with the knees drawn up and the head inclined forward (Fig. 39).

Method.—The skin is anaesthetized five minutes before the puncture is made. Greenfield's manometer records the pressure of the cerebro-spinal fluid in millimetres of water; average normal pressure is 150 millimetres.

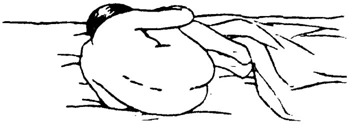


Fig. 39. Lateral position for lumbar puncture.

Intrathecal Injections.—If an injection is to be made into the spinal canal (pp. 372, 445), in addition to the requisites just mentioned, rubber tubing and glass funnel or syringe are needed, also the drug to be injected. The syringe, tubing, and funnel are sterilized by boiling immediately before use. A pin and small piece of cotton wool need to be provided for testing the sensibility of the limbs.

Drugs injected.—Stovaine, novocaine, or prepared serum (p. 835).

1. **Aspiration.**—Small collections of fluid are withdrawn by means of an aspirating syringe; large effusions, such as pleural effusions, are withdrawn by aspirator or by tapping.

Apparatus.—For abscesses and small collections of fluid, aspirating syringe with two needles sterilized by boiling, then placed in spirit, is necessary.

Requisites. — Ethyl chloride spray (see Fig. 186); iodine for purification; two culture tubes; sterilized glass measure to receive the fluid; warm perchloride of mercury (1–2000) and swabs; gauze, wool, and collodion; mackintosh and sterilized towels; receiver for soiled swabs.

Position.—Lying down, dorsal or lateral according to the part to be aspirated.

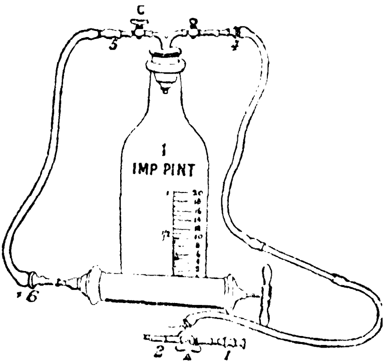


Fig. 40. Aspirator and exhaust pump.

2. **Aspirating the Chest.**—*Apparatus.*—This consists of long trocars and cannulae made in various sizes; the cannula has its openings at one end, one of which is provided with a tap; two aspirating bottles; rubber cork fitted with two pieces of bent metal tubing

with taps; two long pieces of solid tubing and glass connection; air exhaust pump (Fig. 40).

To put the apparatus together ready for use.—Insert the trocar (1) into the cannula (2), and to the other opening in the cannula (3) connect a piece of rubber tubing with glass connection; join the free end of this tubing to the metal tube (4) in the cork placed in the bottle. To the other metal tube (5) connect the second piece of tubing, which is then attached to the air pump (6). Next see that tap B is turned off so that there is no connection between the exhaust bottle and the cannula. After the apparatus has been put together it is always tested to see that it is in perfect working order. To test apparatus proceed as described under 'method.' After placing the trocar and cannula in a bowl of water, the water will be drawn into the bottle if the apparatus is working properly.

Position.—Dorsal or lateral.

Method.—Place the mackintoshes in position, and after purifying the skin, arrange the towels around; the site of puncture is then anaesthetized. Turn off tap B; the trocar and cannula are then introduced, the trocar is withdrawn, and tap A turned off. Tap C is then turned on and the air is exhausted from the bottle by means of the air pump; tap C is then turned off. Tap B is turned on and the fluid allowed to flow into the bottle. It may be necessary to pump the air from the bottle from time to time, but this must not be attempted until tap B has been turned off. When the fluid ceases to flow, the taps are turned off, the cannula withdrawn, and a collodion dressing and firm binder are applied. Patients are very liable to feel faint or suffer from collapse when the chest is emptied; it is, therefore, always necessary to have stimulants at hand (see abdominal tapping requisites).

Abdominal Paracentesis (Tapping).—*Apparatus.*—Small trocar, cannula, and plate; Southey's tubing (Fig. 41).

Requisites.—The sterilized apparatus, which should be placed in warm sterile water; ethyl chloride spray (see Fig. 186); iodine; mackintoshes and sterilized towels; bowl of warm perchloride of mercury (1–2000) and swabs; scissors; boracic lint; adhesive plaster cut into 4 strips 3 inches long by ¼ inch wide; splint thread; reel of strapping; collodion dressing; abdominal binder and safety-pins; small bath or pail, in which is placed a basin containing 1 pint of sterile water, and into which the free end of the tubing is placed before puncturing the abdomen; tumbler of cold water, sal volatile, or brandy; measure glass.

Position.—Fowler's (Fig. 8).

Preparation of patient.—Shave the hair above the pubes if necessary. Pass a catheter five minutes before the tapping is to take place (p. 66).

Method.—Having prepared the patient and arranged the mackintoshes in position, purify the area to be punctured. The trocar, cannula, and plate are then fitted together; the tubing is attached to the end of the cannula. A sterilized binder with an opening made over the site of the puncture is next applied and fastened by pinning at the side. The site of the puncture is anaesthetized (p. 444) and the trocar and cannula introduced, the plate being retained in position by strips of adhesive strapping, the trocar is then withdrawn and the fluid flows into the basin. The tubing is protected from pressure and the patient is covered over. The cannula is left in position until the fluid ceases to flow, often 6 hours or longer; during this time the binder may require tightening from time to time. When the fluid stops running, the cannula is withdrawn and a collodion dressing and clean binder, or a many-tailed bandage is applied. It is most essential to see that the bladder has been emptied immediately before the tapping takes place, otherwise the bladder may be injured by the trocar. The free end of the tubing should be immersed in sterile water or an antiseptic in order to prevent air entering the abdomen. Measure the quantity of fluid and put up a specimen (p. 31).

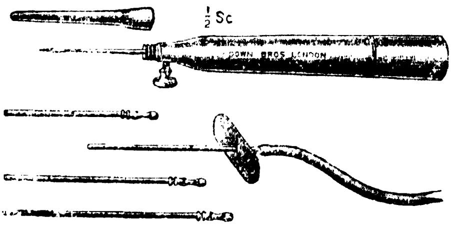


Fig. 41. Southey's tapping apparatus.

N.B.—Some doctors like a piece of boric lint prepared to place under the plate, others prefer the plate to fit tightly against the skin.

Puncturing (Tapping) Oedematous Legs.—*Apparatus.*—Small scalpel.

Requisites.—Mackintoshes; sterile towels; iodine; warm perchloride of mercury (1–2000) and swabs; gauze; wool binders; safety-pins.

Position.—Propped up with the legs below the level of the body. The head of the bed may be raised on high blocks.

Method.—Arrange the mackintoshes, thoroughly purify the limbs (p. 437), and arrange the sterilized towels in position. Small superficial incisions are then made in the legs by the surgeon; the legs are dressed with dry gauze and wool and a binder lightly applied. The bed is arranged in such a manner that the patient's legs are over convenient-shaped trays or dishes in order that the fluid is prevented from wetting the bed as it comes through the dressing. Another way is to place a sterile old blanket on a mackintosh under the legs to absorb the fluid. A cradle must be placed over the limbs to prevent the bedclothes becoming wet. Hot-water bottles are necessary to keep the limbs as warm as possible. The dressings will require changing every 4 hours or oftener at first, according to the amount of fluid draining away. Strict attention to asepsis (p. 428) is necessary, as legs in this condition are liable to become septic. Southey's trocar and cannula are sometimes used for tapping legs; the fluid then drains away into a basin as described under abdominal tapping.

FOMENTATIONS

1. Medical Fomentation.—*Requisites.*—Wringer; square of flannel, size according to the part to be fomented; jaconet an inch larger all round than the flannel; non-absorbent wool an inch larger all round than the jaconet; flannel or domette bandage or binder; safety-pins; bowl with handle; boiling water.

Method.—Place the flannel in the wringer and put the wringer in the bowl with the ends protruding over the edge of the bowl; pour the boiling water on to the flannel until it is completely covered; cover with another bowl and take to the bedside; wring dry and remove the fomentation from the wringer, shake it and apply as hot as can be borne; cover it with the jaconet, mackintosh side next to the flannel; cover the jaconet with the wool and apply the bandage or binder. Before making the fomentation close the windows. When renewing the fomentation, remove the old one, leaving the part covered with the wool; re-roll the bandage and make and apply the fomentation. Jaconet may be omitted if non-absorbent wool is used.

2. Surgical Fomentation.—*Requisites.*—Lint or wool; the lotion ordered; small saucepan; mackintosh; sterilized towel; bowl of warm lotion and swabs; dissecting forceps in a bowl containing carbolic (1–20); sterile jaconet and wool; bandage; wringer.

Method.—Place the lint folded in the wringer in the saucepan containing the lotion; arrange the ends of the wringer so that they are not over the fire. An excellent guard is made by using a piece of aluminium cut and bent thus ‾⊔‾; this is placed inside the saucepan, the wringer containing the fomentation lies on top, the ends resting on the bent metal plates are kept clean and protected entirely from the heat of the flame. Allow the lotion to boil for several minutes, then place the wringer containing the fomentation in a sterile bowl and cover it with the boiling lotion and another bowl. Take it to the bedside and wring the fomentation dry, handing it in the wringer to the person doing the dressing; if the fomentation is wrung out by the dresser, gloves should be worn during the first part of dressing and removed after wringing out the fomentation; the fomentation is then applied and the dressing completed.

3. **Hypertonic Saline Fomentations** are used for the relief of tension in the tissues, as in cellulitis. Two drachms of salt or magnesium sulphate are added to one pint of boiling water in which the lint is boiled. Wring, and apply covered with jaconet, wool, and bandage.

4. **Turpentine Stupe.**—Put turpentine ʒj–ʒiv, according to the strength required, into a warm jug and pour on to it 1 pint of boiling water; pour over the flannel, wring, and apply as a hot fomentation. For infants and young children, place a piece of dry lint or flannel on the wringer, sprinkle over it turpentine ʒj, then pour on 1 pint of boiling water, wring and apply. Turn up the edge of the stupe every ten minutes and remove it as soon as the skin is well reddened.

5. **Opium Fomentation.**—Make a hot-water fomentation, and after wringing it out, sprinkle the required dose of opium over the flannel and apply.

6. **Alkaline or Soda Fomentation.**—Place a teaspoonful of crushed washing soda or bicarbonate of soda on the flannel, pour over it 1 pint of boiling water, allow it to stand a few minutes to dissolve the soda, wring, and apply.

POULTICES (CATAPLASMATA)

1. **Linseed Poultice.**—*Requisites.*—Poultice bowl or pudding basin; jug; spatula; kettle of boiling water; unbleached calico or old linen; two plates heated in the oven or in water; poultice board; linseed meal.

Method.—Put the spatula into the jug, pour boiling water on it and into the poultice bowl to heat it. Spread the linen on the board; empty the water from the bowl and put in sufficient boiling water to make the required size poultice. Add linseed as quickly as possible, a little at a time, stirring with the spatula, until it is of the right consistency. Turn it out on to the linen; if of the right consistency, it will leave the bowl clean. Spread the poultice on the linen, making it about ¼ inch in thickness; leave a margin of linen about 1 inch wide, turn down the edges over the linseed. Dip the spatula in the boiling water and smear it over the surface of the poultice; roll it, place it between the hot plates, and carry it to the bedside; apply, and cover it with wool and a binder. When renewing the poultice, close the windows; remove the old one and rub the skin over with a warm towel; cover the part with wool and a blanket, then make the new poultice and apply. Small poultices may be made on tow. To prepare the tow, draw it out and arrange the strands in two layers, one lengthwise, the other crosswise; roll the edges over the poultice when spread.

2. **Mustard Poultice.**—Add 1 part mustard to 5 parts linseed meal; mix whilst dry; then proceed as for linseed poultice, using water just below boiling point.

3. **Surgical Poultice (Charcoal).**—*Requisites.*—Those given for linseed poultice, and, in addition, gauze instead of calico on which to make the poultice; wood charcoal in powder; carbolic lotion (1–40 or 1–60).

Method.—Mix 1 part charcoal with 2 parts linseed (1–3). Pour a sufficiency of boiling carbolic lotion into the sterile basin; add the mixed charcoal and linseed gradually; turn out and spread on a double thickness of gauze and cover with a single fold of same. Place the poultice in a sterile and heated porringer with a lid and take to the bedside. Everything used for making the poultice should be rendered sterile (p. 40) and the nurse should purify her hands beforehand (p. 46).

4. **Starch Poultice.**—*Requisites.*—Starch; boric powder; cold water; boiling water; linen or gauze; spatula.

Method.—Take 4 tablespoonfuls of white starch and add 1 teaspoonful of boric powder and sufficient cold water to melt the starch. Pour on ½ pint of boiling water, stirring all the time until the starch has dissolved. Leave until cool, then spread thickly on the linen and apply.

To apply.—Place directly over the sore and cover with gutta-percha tissue and bandage in position.

Used to remove crusts and scabs in some skin affections.

The Application of Ice.—1. **Ice bag.**—Chip and crush the ice into small pieces and fill the bag a quarter full; add salt; expel the air; see that the bag is securely stoppered and dry outside. Place a piece of lint over the part to which the bag is to be applied. Suspend the bag by means of a piece of bandage tied round its neck and fastened to a cradle over the patient. The bag should just touch the patient without all its weight resting. If ice is to be applied to the head, the bag may be suspended from the bedrail. Ice cradles are used when a large surface is to be kept cool. They are specially constructed cradles, having either small pails or a tray to be filled with ice (Fig. 42).

2. **Ice Poultice.**—*Requisites.*—Gutta-percha tissue; salt; wool; ice; chloroform; paint brush.

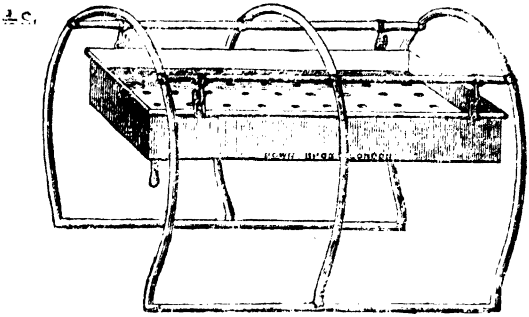


FIG. 43. Ice cradle.

Method.—Cut the gutta-percha tissue double the size of the required poultice and fold it in half. Cover one half with a thin layer of wool on top of which place small pieces of ice; sprinkle salt over the ice; cover with another layer of wool and finally with the second half of the gutta-percha

the brush dipped in chloroform, and seal them by pressing them together. Apply over a layer of lint and bandage in position. Bran may be substituted for the wool.

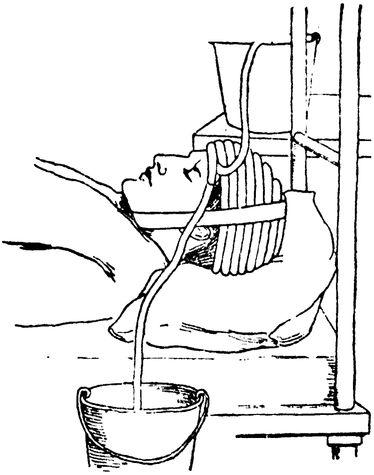


FIG. 43. Leiter's coils applied to the head.

Leiter's Coils (Fig. 43).—These coils are made in various sizes according to the part to which they are to be applied. They may be used either as hot or cold applications.

Requisites.—Coils; two pails; hot or cold water.

Method.—Apply the coil over a fold of lint; place one pail on a locker above the patient and fill with either cold or hot water; place the second pail below the bed under the tube to catch the water as it runs off. A thermometer should be hung in the water to see that the correct temperature is maintained.

Evaporating Lotion.—Place the limb to be treated on a piece of jaconet; apply lint wrung out of the lotion and bandage in position with a gauze bandage. Place a cradle over the limb to allow of evaporation. The bandage and lint require to be kept moist with the lotion; this may be dropped on without removing the bandage. Lead lotion may be applied in this way, or as a cold compress according to surgeon's orders.

Cold Compress.—This may be applied with water, or any lotion ordered. Soak a double fold of lint in the water or the lotion prescribed; apply to the limb and cover with a piece of jaconet larger than the lint; bandage. Change the compress every four hours, or oftener. A compress applied for preparing the skin for operation (p. 437) does not require changing every four hours.

Alcohol, or Spirit, Compress.—Soak a double fold of white lint in the spirit and apply covered with jaconet and wool, and bandage in position. A curative application for local septic conditions, such as septic finger, carbuncle, etc. Also used as a pre-operative dressing, substituting a dry sterile towel for jaconet and wool.

Plasters.—Plasters may be applied for the following purposes: to apply anodynes or astringents; to act as counter-irritants; to protect or support a wound; to retain dressings, splints, etc., in position; to support or immobilize a joint. Plasters in which drugs have been incorporated are applied as follows:

Method.—Cut the plaster to the required size; snip the edges to enable it to fit the part without creasing; cut several small holes for ventilating purposes if the plaster is made on chamois leather. Wash and dry the skin over which the plaster is to be applied; warm the plaster, apply, carefully avoiding any creases; bandage in position if necessary.

To apply a Belladonna Plaster to the Breast.—Cut a hole in the centre of the plaster sufficiently large to enable the nipple to protrude; snip the plaster round the outside edges. After washing and preparing the skin apply the plaster to the lower part of the breast; raise the breast and apply the upper part of the plaster in such a manner that the breast is supported. Apply a bandage to support the breast (p. 136).

Plasters are left on until their object has been attained, unless there are symptoms of too free absorption of the drug, or discomfort and irritation of the skin.

Mustard Leaf (Sinapism).—This is an 'official' preparation used as a counter-irritant.

To apply.—Cut to the required size, then soak the leaf in tepid water, allow the water to drip off, then apply to the skin. Remove as soon as the skin is reddened and the patient complains of pain from burning. Dust the skin with dusting powder and cover with a piece of wool or dry lint. The sinapism should never be left on long enough to cause blistering of the skin.

Strapping, or Adhesive Plaster, used in connection with Splints and Extension.—Method of application, see p. 150. *To remove*, moisten with acetone, ether, turpentine, or eau-de-Cologne.

Blisters.—Blisters may be applied either as plaster (cantharides plaster) or fluid (cantharidal collodion, i.e. blistering liquid).

1. *Blister plaster.—Method.*—Wash and, if necessary, shave the area to be blistered. Apply the plaster after gently heating it, cover with gauze lightly strapped in position. Leave in position until a blister is raised, then remove the plaster; snip the blister at its lowest edge with a pair of sterilized scissors; have ready a sterile swab to absorb the fluid. Apply an ointment dressing cut to the size of the blister, cover with wool and keep in position with narrow strips of strapping. Olive oil may be used to remove the plaster if there is any difficulty in peeling it off.

2. *Blistering fluid.*—After cleansing the skin, smear vaseline around the area to be blistered. Paint the blistering fluid on the skin inside the vaseline, taking care that none is allowed to run down. Leave uncovered until dry, then cover with a piece of gauze lightly kept in position with strips of strapping. When the blister rises, snip it and dress as described above.

3. *Flying blister.*—In conditions where there is extensive effusion which necessitates prolonged blistering, what is termed a flying blister is used. A space over the part to be treated is mapped out, divided into 4 or 6 squares, and to one of these squares a blister is applied on successive days. After the last space is blistered the first space is ready for blistering again, should this be necessary. When it is desirable to keep up the counter-irritation, the skin over the blister is removed entirely and the exposed surface is dressed with Savin ointment. The ointment dressing must be exactly the size of the raw surface and covered with gauze and wool.

Liniments.—These are applied by rubbing or friction. A sufficient quantity of the liniment is taken on the palm of the hand and rubbed into the skin over the affected area. Friction should be given with the whole hand flat, and in the case of application to the limbs should follow the direction of the lymphatic circulation.

Iodine may be applied to the skin as an antiseptic in the preparation of the skin for operation (see p. 437), or in order to act as a counter-irritant. To apply as a counter-irritant the skin should be rendered dry and clean by swabbing over with methylated spirit allowed to dry. Iodine is then painted over the area and allowed to dry. When dry a second application of iodine is applied. It is advisable to apply the first coat in longitudinal strokes, the second with horizontal strokes. The iodine may be applied with a camel-hair paint brush or swabs of wool held in forceps. One coat of iodine is usually sufficient for a child's skin. If the iodine treatment is ordered to be applied daily for several days the part to be treated should be mapped out in 3 or 4 squares, one being painted each day. The continuous application of iodine to the skin renders the skin hard and the effect is lost. When painting a joint such as the knee, shoulder, or elbow the bony prominences should not be included.

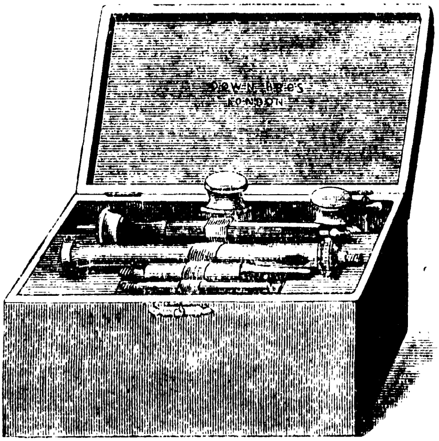


FIG. 44. The Paquelin cautery, lamp and point.

Cautery.—The Paquelin cautery (Fig. 44) is the one commonly used. To prepare the cautery fit the point on to the handle and connect the other end of the handle with the rubber tube to the bottle containing the benzine. Connect the rubber tube attached to the bellows to the other nozzle of the benzine bottle. Light the spirit lamp and hold the point in the flame until it is hot, then pump air from the bellows over the benzine into the point; this will cause the point to glow brightly red and remain red as long as the vapour benzine is pumped into it. The point is removed from the flame before using the bellows. The cautery may be used for the following purposes:

1. To arrest haemorrhage by searing the bleeding vessels, p. 565.
2. *For the relief of pain as a counter-irritant.*—The heated point is not brought into contact with the skin but is moved to and fro in close proximity to it, so as to cause a reddening of the surface.

Useful in lumbago and sciatica. For this treatment a hot laundry iron could be substituted for the cautery. A piece of thick brown paper is laid on the skin and the iron passed several times lightly over it until the skin is reddened.

3. *For the treatment of chronic joint inflammation.*—The point of the cautery is kept at a dull red heat and is lightly drawn across the part to be treated so that a superficial burn results, which is dressed with an ointment dressing or triple dye jelly (p. 99).

Inunction.—Consists in rubbing medicated ointment into the skin in order that it may be absorbed into the system. Drugs most commonly used for inunction are mercury, cod-liver oil, olive oil.

1. *Mercurial inunction.*—Mercurial ointment, ½ to 1 drachm; piece of lint.

Method.—The patient has a hot bath, directly after which the ointment, previously divided into two portions on the lint, is rubbed into the skin of the undermentioned parts in the following order: *1st night,* inner surfaces of right thigh and arm; *2nd night,* left thigh and arm; *3rd night,* calf of right leg and right flank; *4th night,* left calf and flank; the inunction is then omitted for one night, after which the procedure is repeated. Inunction into the groin, axilla, or other hairy parts must be avoided, as it is liable to produce eczema or boils (p. 832), and, in any case, is uncomfortable for the patient. Adult patients are entrusted to do the inunction for themselves; in the case of children the nurse must do it and wear rubber gloves, otherwise she may absorb the mercury herself.

Patients undergoing this treatment need to have a mouth wash three times a day (p. 15) and pay particular attention to the cleansing of the teeth. Any symptom of intolerancy of the drug must be reported to the physician (see drugs, p. 771).

2. *Inunction of cod-liver oil or olive oil* is prescribed in cases of acute wasting and marasmus (p. 601). The oil is warmed and then rubbed into the abdomen or, in some cases, into the surface of the whole body, the head and face excepted.

Application of Unna's Paste.—*Requisites.*—Block of Unna's paste (zinc and gelatin paste of the B.P.C.); spirit lotion; gallipot containing water of temperature 110° F.; bandage 3 inches wide prepared from a roll of white sterile gauze four layers thick, or of soft book-muslin quite free from starch or dressing; large flat paint brush or suitable swab; gauze or crêpe bandage.

The block of Unna's jelly is placed in the container surrounded by water just warm enough to melt the jelly (about 110° F.).

The ulcer to be dressed should be clean and the skin around should be washed and dried by means of a spirit lotion which is allowed to evaporate.

The part to be covered should then be painted with a thick coat of the jelly, by means of the flat brush or cotton-wool swab, and immediately covered by a single layer of the bandage which must be evenly and firmly applied. It should be applied firmly enough to make the jelly bulge through its interstices, and to avoid creases and ridges in the bandage, it may be cut into lengths as often as necessary as it is bound on. Another thick coat of jelly is applied and then another layer of bandage until about six layers are in position. Nothing should be allowed to touch the dressing until it is firmly set. It may then be covered with a light bandage, unless the patient is going to wear a crêpe bandage or elastic stocking. To remove the dressing it should be saturated with warm water.

This dressing does not fulfil its purpose unless when it is set it is tighter than the skin.

Wax Dressing.—*Requisites.*—Ambrine or wax, sterile dry absorbent wool; roller bandage; camel-hair paint brush.

Method.—According to the size of the wound melt from ½ to 3 ounces of wax by placing it in a small jar in a pan of water just below boiling point for 10 minutes. Allow it to cool slightly then apply it over the wound, using a soft paint brush, and using a dabbing and not a sweeping movement. Apply the wax as hot as the patient can bear it. Apply several coats so that the various layers one over the other form a kind of varnish. Next take a tuft of cotton wool and dab it lightly all over the wax; this will leave small tufts of wool sticking to the wax; continue until the wax is covered. Then pass the brush over the cotton wool until it is saturated. Apply a piece of dry cotton wool and a firm bandage.

The dressing will require renewing every 24 hours at first; later every 48 hours will suffice. Before applying the new dressing, wash the wound with sterile water or a very weak antiseptic solution, then dry by gently dabbing with cotton wool. The wound requires to be quite dry before the application of the wax.

Treatment of Burns.—For description, first aid, and complications of burns, see p. 521.

Before commencing the treatment of burns two important factors require attention: (1) the treatment of primary shock; (2) the prevention of cross infection by rendering the hands surgically clean, and wearing a mask as a preventative of *droplet infection*, which accounts for much of the sepsis in burns. Treatment is divided into two main groups, i.e.: A by coagulation; B by non-coagulation—irrigation, baths.

A. *Treatment by coagulation.*

(1) *Vital dye jelly treatment.*—Two dye jelly preparations recommended as reliable and effectual are: gentian violet, 1 per cent, with merthiolate 1–5000, and triple dye jelly, with sulphathiazole, made from 1 per cent aqueous solution of gentian violet and brilliant green, with 0·1 per cent solution of neutral acriflavine and sulphathiazole, 5 per cent.

These jellies are antiseptic and analgesic in action, and usually afford relief from pain in a few minutes; they also cause an eschar (tan), which is not so thick as that produced by tannic acid, but is much more flexible.

Application.—The jelly is applied to the burnt area without any cleansing whatsoever, but if a blister has already formed it is necessary to snip the blister with sterile scissors and remove any dead skin beforehand. The jelly is squeezed from the previously cleansed tube, directly over the wound. A generous application should be given, and tanning commences at once. No dressings whatsoever are used.

(2) *Vital dye solution. Hospital treatment.*

Cleansing.—If no treatment has been given, the burnt area is cleansed with soap and water, and finally with saline solution; blisters are snipped and the dead skin removed whilst the patient is under an anaesthetic. The area is then dried by means of an electric hair dryer, or by means of electric lamp bulbs. The burnt surface is then sprayed, or dabbed with warm triple dye solution with sulphathiazole; the strength of the solution is identical with that of the jelly.

This application is then dried, and a second one given, which in turn is dried. A thin supple tan is thus usually formed which is quite adherent everywhere, and no sepsis appears around the edges of the tan. As a general rule the tan becomes loosened about the tenth day, and usually falls off bit by bit, leaving a healed area underneath. In extensive third-degree burns, when the tan falls off a healthy granulating surface is exposed; for this skin-grafting is essential to prevent deformity and scarring (see Thiersch method, p. 465).

(3) *Tannic acid solution* (5 *per cent*) *and* 10 *per cent silver nitrate solution* may be used in the same manner as triple dye, but do not give such a satisfactory result, as they have no antiseptic properties, and should never be used on the face or hands, or for any case where a long delay has elapsed between the accident and hospital treatment.

Nursing.—From the time the coagulum or eschar has formed the bedclothes are supported and the areas directly exposed to the air. Care is to be taken that the coagulum is not damaged. In the case of children the limbs must be secured. In burns of the face, the eyes, nostrils, and external auditory meatus are protected with moist cotton wool during spraying, and artificial drying is dispensed with. Sometimes the whole burnt area cannot be simultaneously exposed to the air, as when the front and the back of the trunk are invaded. In such cases the most extensive area is exposed, the patient lying on the part least affected. The exposed area is treated by spraying and drying, whilst a gentian violet compress is applied to the other area.

In burns of the perinaeum and buttocks the patient lies in the prone position, with a pillow supporting the pelvis, and the bowels are regulated by rectal lavage. Parts subjected to pressure are covered with dry gauze or Elastoplast. Every effort should be made to prevent soiling of the burned areas with urine, which may give rise to release of toxin, also sepsis. Occasionally some fluid collects under the coagulum, and this should be evacuated through an opening cut with sterile scissors and sealed with triple dye solution or jelly.

After the healing of any burn it is very essential that the healed surface which is covered with new skin should have lanoline rubbed into the area at night for fully 6 weeks. After skin grafting, or if X-ray therapy has been used, this treatment is also adopted.

(4) *Picric acid compress* consists of a double fold of white lint, saturated in picric acid, large enough to entirely cover the burnt surface, covered with sterile wool and bandaged in position.

Picric acid is an antiseptic and coagulant, but has the great disadvantage that the dressing adheres to the wound, and on being removed some of the tissues may be torn, thus increasing the depth of the lesion and causing much pain.

(5) *Penicillin cream.*—Described on p. 841.

B. *Treatment by non-coagulation.*

Infected or septic burns are not treated by coagulation. (1) *Immersion* in saline bath or (2) *irrigation* in irrigation envelope may be employed.

(1) *Saline bath.*—Extensive body burns not able to be treated with triple dye solution are also successfully treated in saline baths. The bath is first filled with 30 gallons of warm water, temperature 105° F., to which is added 1 gallon of saturated solution of common salt. This gives 0·9 per cent solution.

Water at 105° F., to which is automatically added sufficient salt to form a physiological solution, runs into the bath at the rate of

1 gallon per minute by means of an automatic device emptying at the other end. A similar quantity is allowed to run out from the bottom of the bath by means of an overflow valve. The temperature is controlled by an electric thermostat.

The patient remains in the bath ½ hour, or longer if he is comfortable; a blanket covers the bath. He is then returned to bed and placed on sterile towels under a large heated bed-cradle. A spinal reversible bed, if procurable, aids dressing and nursing.

When the burnt areas are dry they are dusted with sulphanilamide powder and covered with 'tulle gras' (p. 442). The bath is given once or twice daily until healing is complete, or until the burnt area is ready for skin grafting.

(2) *Envelope irrigation treatment* (Stannard's).—A solution of electrolytic sodium hypochlorite (Milton), at a temperature of 100° F., is applied to the burn, wound, or ulcer by means of a Stannard irrigation envelope (Fig. 45) of appropriate size and shape which is fitted to the limb or part of the trunk on which the lesion is situated.

The envelope is made of transparent coated silk, which because of its smooth surface does not adhere to the surface of the wound, and is of ample size to permit the movement of the limb, thus avoiding immobilization.

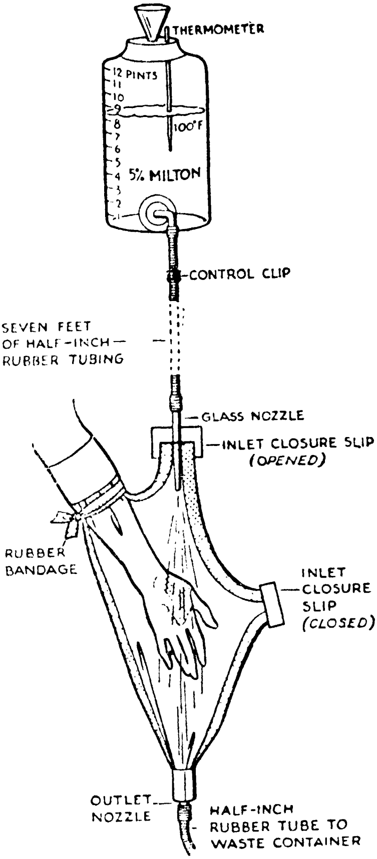

THERMOMETER
12 PINTS
11
10
9
8
7
6
5
4
3
2
1
100°F
5% MILTON
CONTROL CLIP
SEVEN FEET OF HALF-INCH RUBBER TUBING
GLASS NOZZLE
INLET CLOSURE SLIP (OPENED)
RUBBER BANDAGE
INLET CLOSURE SLIP (CLOSED)
OUTLET NOZZLE
HALF-INCH RUBBER TUBE TO WASTE CONTAINER

FIG. 45. Irrigation of hand in Stannard's irrigation envelope.

It is fixed to the limb or body by special plaster bands, which are reinforced by two additional thicknesses of webbing plaster, and has inlets and outlets which are closed between irrigations by adhesive slips or rubber clips, thus providing a measure of protection against secondary infection—cross infection—and fly infection in the tropics.

The *initial* irrigation to cleanse the lesion is carried out with 1–5 Milton solution, if necessary under light anaesthesia. Subsequently irrigation with 1–20 Milton—which is usually painless—is carried out for 20 minutes three times daily. Immersion is not employed.

Thorough drainage after irrigation is important, otherwise skin irritation may occur. Drainage is obtained by placing the limb in such a position that any exudate or residual moisture flows towards the outlet away from the seal, then passing filtered warm air or oxygen through the envelope, thus ensuring the drying of the limb and envelope.

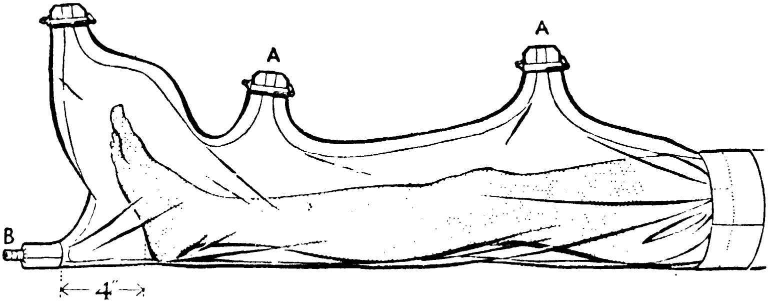


FIG. 46. Leg enclosed in Stannard's irrigation envelope.

The envelope once applied remains in position until removal or renewal is necessary—usually after 3 weeks—thus avoiding interference with healing and pain caused by changing dressing.

The strictest aseptic precautions are necessary throughout the treatment; the end of the rubber tube or the glass nozzle forming the jet should always be sterilized.

To sterilize the envelope after use, immerse the envelope up to the seal (do not wet the seal) in a 10 per cent Milton solution at a temperature of 75°–80° F. for at least 5 minutes; afterwards drying the outside of the envelope with a sterile towel.

Summary.

Milton solution	5, 2½, or 1 per cent
Temperature	100° F.
Duration	20 minutes
Frequency	3 to 1 daily
Thorough drainage	30 minutes

Scott's Dressing.—*Requisites.*—White lint; unguentum hydrargyri compositum (mercurial ointment); soap plaster; roller calico bandage; scissors; enamel jug filled with boiling water.

Method.—Cut strips of lint 1½ inches wide and 3 inches longer than the circumference of the limb. Cut strips of soap plaster the same size. Spread the ointment on the strips of lint (smooth side). Apply the middle of a strip to the back of the limb about 2 inches below the joint; bring the ends round and cross them over the front of the limb; take a second strip and apply in the same way, the edges just overlapping the upper edge of the first. Continue with strips until the joint is covered. Heat a strip of strapping and apply over the first piece of lint, and in the same manner continue until the lint is all covered. The strips of strapping should overlap each other a quarter of an inch to make them firm. When crossing the strips in front, see that the pattern is kept in line. Apply a firm calico bandage (p. 129).

Antiphlogistine is a patent preparation composed of Denver mud and medical substances.

To apply.—Heat the antiphlogistine by standing the tin in boiling water. When hot, spread thickly on wool or lint, cover with one layer of gauze, and apply; cover with warmed wool and bandage in position. It may be left on from 6 to 24 hours, after which it becomes dry and uncomfortable.

Leeches (Hirudines).—*To apply leeches.*—Allow the leech to swim in cold water. Wash the part to which the leech is to be applied with hot water and soap; dry it and moisten with milk. Cover the part to be leeched with a piece of dry lint in which small holes have been cut corresponding to the sites of the required punctures. Dry the leech and either hold it in a dry cloth or place it in a test tube half filled with dry cotton wool. If the leech is held in a towel, incline its head over one of the holes in the lint; if it is in a test tube, invert the tube over a hole in the lint. If there is difficulty in getting the leech to bite, moisten the skin with sugar and water or drop of blood if necessary. When the leech has taken hold firmly, remove the test tube or towel and allow it to rest on the lint, where it may be left until it drops off. Dress the punctures with wool placed in several thin layers and cover with a pad and bandage. When the bleeding ceases, discontinue the dressing and cover the puncture with a small round of adhesive plaster. If it is necessary to induce more bleeding, the punctures are fomented instead of being dressed. Should the haemorrhage be excessive, apply firm pressure with a pad and bandage; if this does not check it, the leech-bite may be touched with nitrate of silver stick. **A leech must never be pulled off once it has 'taken hold.'**

When applying leeches to mucous membranes in cavities such as the vagina or mouth, they must be carefully adjusted in test

tubes or leeching glasses. Should the leech gain access to a cavity, it can be removed by giving an injection of normal salt solution. After use, destroy the leech by placing it in carbolic lotion (1–20) unless it is needed again for the same patient, in which case place it in a clean bowl and sprinkle it with salt; this will cause it to disgorge the blood, after which place it in a jar of clean cold water covered with a perforated lid.

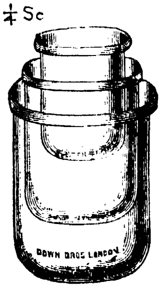


FIG. 47. Cupping glasses.

Cupping.—There are two kinds of cupping, viz. 'dry' and 'wet.' In dry cupping the blood is only drawn to the surface; in wet cupping it is withdrawn from the body.

1. **Dry Cupping.**—*Requisites.*—Cupping glasses; vaseline; methylated spirit; swabs; or spirit lamp.

Method.—Smear the edge of the cup with vaseline, then swab round the interior with methylated spirit, set it alight and invert the cup quickly over the area to be cupped, pressing it firmly against the skin. The closure of the glass will extinguish the flame, and a partial vacuum being formed the skin will be drawn into the cup. Another method is to heat the cup over the flame of the spirit lamp and apply as described. To remove the cup depress the skin at the edge of the cup; this introduces air and the cup can then be lifted off. A glass jam jar makes a good substitute for cupping glass.

2. **Wet Cupping.**—*Requisites.*—As for dry cupping, in addition small scalpel or scarificator; iodine for purification; warm perchloride of mercury (1–2000) and swabs; mackintosh and sterilized towel.

Method.—Purify the skin (p. 437), then dry cup as described. Small incisions are then made in the skin with the scalpel or a special scarificator, and the cupping glass is reapplied. The cup is emptied and reapplied as often as required. When finished, swab the skin with warm perchloride of mercury (1–2000) and apply either a dry dressing or an ointment dressing (p. 441).

Bier's Treatment.—Consists in promoting passive congestion of a part; it may be applied by means of an elastic bandage or by Bier's cupping glasses.

For joints below the hip and shoulder the following method is used: Apply a piece of white elastic 2 inches wide and 2 yards long around the limb above the affected joint; it should be sufficiently tightly applied to cause a bluish-red discoloration of the parts below. It is applied for about 10 minutes the first day, increasing the time until it can be borne for several hours a day. During the time the bandage is on, the limb must be carefully watched to see that it does not become too congested.

Passive congestion by dry cupping.—Special cups are in use for this purpose (Fig. 48), and they may be had in a variety of shapes and sizes to fit the part to be congested. Smear the rim of the cup with vaseline, compress the rubber ball, exhausting the air, and apply. The congestion is maintained for a few minutes, then relieved; this is repeated several times until the part has been congested for about 15 minutes. The procedure is repeated daily, the part being congested a little longer each day.

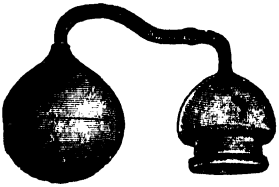


FIG. 48. Bier's cupping glass.

Inhalations.—These may be administered either moist (with steam) or dry.

1. **Moist Inhalations.**—*Requisites.*—Inhaler (Fig. 49) or jug; the inhalation; boiling water; flannel cover or towel.

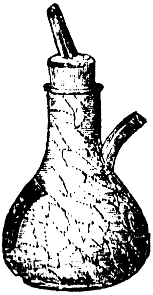


FIG. 49. Earthenware inhaler.

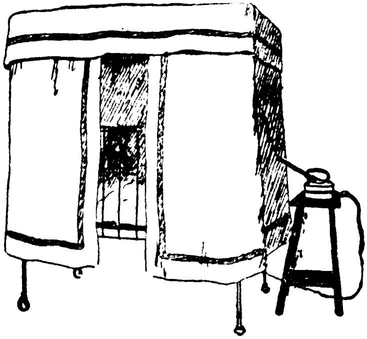


FIG. 50. Steam tent.

Method.—Heat the inhaler or jug with boiling water. Empty out the water and put the prescribed dose of the inhalation into the inhaler. Pour on 1 pint of boiling water and place the flannel cover or a towel around the inhaler. Instruct the patient to place the mouthpiece between the lips and to inhale through the mouth, then exhale through the nose. If a jug is used, place a towel over the patient's head to prevent the escape of the steam.

Drugs prescribed.—Menthol, eucalyptus, friar's balsam, turpentine, pine oil.

2. **Aerosol.**—Penicillin mist spray, described on p. 841.

3. **Steam Tents** (Fig. 50).—A tent is used when it is necessary

to keep the air breathed by the patient moist and warm, or when a continuous inhalation of a drug is required.

Requisites.—Tent frame with tent sheets, or two large towel horses with two sheets; steam kettle, either electric (see Fig. 50) or with spirit stove; bucket of sand.

Method.—The frame is attached to the bed, over which the sheets are tied or pinned, and an opening is left in one side of the tent away from the window or the door. A thermometer is hung inside the tent; an even temperature must be maintained, 70°–75° F., unless otherwise ordered. The kettle is filled with boiling water (the drug, if any, is placed in the kettle) and placed on a stand at the foot or side of the bed. The spout of the kettle is introduced into the tent through a hole in the sheet at the foot of the bed or through the opening at the side. A small receptacle should be hung over the spout to catch any drips. A bucket of sand should stand at the side of the kettle in case of any accident. If the patient is a child, arrangements must be made to prevent it touching the spout or any apparatus. Electric kettles are the most convenient and the safest; these are in use in hospitals; in most private houses a spirit stove must be used. Two kettles should be in use, the full being brought to the bedside before removing the other. The kettle will require filling every 3 or 4 hours according to the size; electric kettles require filling more frequently.

Drugs prescribed.—Creosote; friar's balsam; eucalyptus.

4. **Dry Inhalations.**—*Requisites.*—Burney Yeo's inhaler or any other suitable one; pipette; vaseline; the inhalation.

Method.—Drop the prescribed dose of the inhalation on to the sponge in the centre of the inhaler, using the pipette. Care is needed to drop the fluid only on to the sponge, otherwise the patient's chin or nose may be blistered as the drugs used are very concentrated. Smear a little vaseline over the patient's chin and nose. Place the inhaler over the mouth and nose and keep in position by fastening the loops of elastic around the ears. The inhaler is kept on until the drug has evaporated, usually about ten minutes.

Drugs prescribed.—Creosote, pine, eucalyptus.

5. **Inhalation of Volatile Drugs without an Inhaler.**—(*a*) *Amyl nitrite.*—This drug is prepared in glass capsules enclosed in gauze.

To administer.—Place the capsule in a small piece of lint; crush it between the finger and thumb till it breaks; then hold to the patient's nose.

(*b*) *Strong ammonia.*—Sprinkle two or three drops on to a piece of lint and hold two or three inches away from the patient's nose. Caution is needed in the use of strong ammonia; if too strong a dose is placed near the mouth and nose it obstructs breathing.

Oxygen.—Inhalations of oxygen, or oxygen 5 per cent with carbon dioxide 1 per cent, are commonly prescribed in diseases of the heart and lungs, for shock, gas poisoning, and during and after anaesthesia. Three modern methods of administration comprise (1) oro-nasal inhalation, (2) nasal inhalation, (3) tent.

(1) *Oro-nasal inhalation.*—The B.L.B. apparatus (see Plate III) is used, and includes a complete set of fittings from oxygen cylinder to mask, comprising regulator, flowmeter, needle valve, inhaling-exhaling valve, rebreathing bag, tubing, connection, and mask.

Two masks are provided, one oro-nasal and one nasal; the rebreathing bag is only in use with the oro-nasal mask.

To assemble.—The regulator is attached to the oxygen cylinder sufficiently tight to prevent leakage—after opening the cylinder valve for a moment to ensure there is no blockage. The needle valve outlet on the flowmeter is opened, the cylinder valve is then fully opened, and the needle valve closed. Tank pressure is automatically reduced so that the flow of gas is easily controlled by the needle valve on the outlet which regulates the amount of oxygen delivered to the patient. The flowmeter is graduated to show the amount passing through. The rubber tube attached to the bag and mask is then fitted on to the outlet at the top of the flowmeter, and the apparatus is ready for use. Moulded into the down tube of both nasal and oro-nasal mask is a holder for the inhaling-exhaling valve. This valve is a finely grained sponge rubber disc, which slips easily into its holder. The graduations on the flowmeter give the number of litres delivered per minute, 2–4 being a usual quantity; but this varies according to the size of the person, the volume of respiration, and the condition requiring treatment. If the nasal mask is being used and the patient's mouth is partly open a larger volume of oxygen is necessary. The oro-nasal mask is used when there is any nasal obstruction.

Sterilization.—The sponge rubber inhaling-exhaling valve is removed by squeezing the sides of the holder and lifting it out with thumb and forefinger. It is boiled for 3 minutes, rinsed thoroughly in sterile water, and dried.

The whole of the inhalation apparatus attached to the flowmeter is removed, washed in soap and water, boiled for 3 minutes, and thoroughly rinsed in sterile water.

(2) *Nasal inhalation* may be administered by the B.L.B. mask described above, or by means of twin nasal catheter spectacles.

Required.—Oxygen cylinder in stand with regulating valve, a length of rubber tubing attached; flowmeter or Wolff's bottle containing warm water; 'Orbito' spectacles with rubber tubing attached; Y connection; 2 sterile nasal catheters; vaseline.

Assembly.—The 'Orbito' catheter spectacle device, Plate XXXI, consists of a spectacle frame, to which a metal tube, fitted with a nozzle, is fixed to each eye rim. Rubber tubing is attached to each of these nozzles and carried from either side to join a Y connection. The free end of the Y connection being fitted to the tubing attached to the flowmeter or Wolff's bottle, the tubing from the oxygen cylinder is fitted to the other tube in the flowmeter or bottle. The metal tube on the spectacle frame is carried down either side of the nose, and fitted with nozzles to which the nasal catheters are attached. (See Plate XXX.)

Method.—After lubricating the sterile catheters they are fitted to the nozzles on either side of the nose, and passed through the nares into the naso-pharynx, the spectacles being comfortably adjusted. The oxygen is then turned on. It is unnecessary to remove spectacles and catheters if frequent inhalations are required; simply disconnect the tubing at the Y connection after turning off the oxygen at the cylinder. The advantage of this device is that the patient's mouth is entirely free, his movements are not restricted, and, if he is restless, the apparatus remains in position.

Emergency method.—In an emergency where no special apparatus is available, oxygen may be administered by a funnel connected with tubing to the oxygen cylinder. A pickle jar with 2 holes in the cork will make a substitute for a Wolff's bottle; the rate of flow of the oxygen may be judged by the amount of bubbling in the water, which should just bubble slowly. The tubing from the cylinder is fitted to one opening in the Wolff's bottle, the tubing attached to the funnel to the other. If the oxygen has to be given with tubing direct from the cylinder, without intervening bottle, the oxygen is turned on until a gentle breeze is felt. The funnel is then held close to, but not touching, the patient's nose and mouth.

This is an unsatisfactory and wasteful way of inhaling oxygen except as an emergency measure, as so much of the oxygen is lost, and the patient does not derive the same benefit from the inhalation.

Caution.—When administering oxygen a new cylinder should not be opened at the bedside. If the screw is tight, oxygen may escape with a loud report, which may frighten the patient, and in a heart case might cause serious harm.

Oxygen tent.—St George's Hospital pattern.—This apparatus for the administration of oxygen has undergone extensive clinical tests, and has been approved by the physicians of the hospital. It is constructed on the 'open top' principle and consists of strong cast base with easy-running castors and tubular upright. The frame carrying the hood is adjustable to any desired position horizontally and vertically, and is therefore suitable for use with any type of bed or cot. The hood is made of soft velvet-finished rubber with non-inflammable windows, and at the bottom the neck orifice is designed to fold loosely over the patient's chest. There are no fastenings to cause discomfort. This enables the patient to be fed and use a handkerchief or spittoon without diminishing to any great extent the oxygen concentration. The head only being enclosed, the whole body is quite free for examination and nursing (Plate III).

An ice-box is fitted to the upright of the stand and provides an efficient cooling system for the oxygen. The inside is fitted with a coiled metal tube of adequate length and bore, and the space around the coil is filled with crushed ice and water to ensure contact with the coil.

A draw-off tap is provided for the disposal of melted ice. The approximate quantity of ice per day is 10 pounds.

The apparatus is light and portable, and when not in use can be folded, thus occupying the minimum of space for transportation or storing. It is easily disinfected.

The apparatus in use.—The apparatus is quite simple to assemble and to operate. The oxygen passes from the cylinder through the rubber tubing to the ice-box connection, through the coil at the rate of 10 litres a minute for about 7 minutes, the rate is then reduced to 6 litres a minute. Rubber tubing connects the ice-box outlet to the bottom of the hood and the oxygen then passes through a specially designed rubber tube with perforations through which a steady flow is produced. With this supply the oxygen concentration at the level of the patient's nose is approximately 50 per cent. The use of an efficient compound regulating valve on the oxygen cylinder is essential to control the flow and the B.O.C. type 32673 is recommended. With this type of tent a carbon dioxide absorbent is unnecessary, as the expired air diffuses and passes out of the top. A simple apparatus is available for estimation of the carbon dioxide and oxygen contents.

2. Oxygen may also be used in the treatment of chronic wounds and ulcers. The technique is described on p. 101. Under irrigation envelope is the modern method.

Packs.—1. **Hot Dry Pack.**—*Requisites.*—Four hot blankets; six hot-water bottles without covers; requirements for hypodermic injection (p. 84); pilocarpin.

Method.—Open the blankets and lay them one on top of the other; roll them and place under the patient. Strip the patient and wrap each blanket round him separately, tucking it in tightly around the neck and folding it over the feet; the blankets need to be wrapped round firmly. Place the bottles around the patient three at either side, and cover the bed with the usual bedclothes. Give hot drinks freely, using a spouted feeder (p. 30). If pilocarpin is prescribed, the required dose is given hypodermically (see hypodermic injections, p. 844) immediately before wrapping up the patient. When the sweating has ceased, remove the blankets, rub the patient down with hot dry towels, dress him and leave between warm dry blankets. A flannel shirt or gown should be worn. Duration of pack, 1 to 1½ hours.

2. **Hot Wet Pack.**—*Requisites.*—Four blankets; long mackintosh; large wringer with sticks; small bath; boiling water; hot-water bottles.

Method.—Arrange the blankets and mackintosh in the following order, two blankets, mackintosh, blanket, and roll them under the patient. Strip the patient, leaving him covered with a blanket. Fold an old blanket or sheet lengthwise and place it in the wringer in the bath. Pour on boiling water and wring it as dry as possible, using the sticks in the wringer; two persons are necessary for this. Take the blanket out of the wringer, shake it, and roll it quickly under and over the patient, wrapping it closely around the neck and folding it over the feet. Wrap the dry blanket over it, then the mackintosh and the other two blankets, folding them tightly over the feet and closely around the neck. Place the hot-water bottles around and give the patient frequent hot drinks. Duration of pack, 20 minutes after sweating commences. Then remove the two blankets next to the patient and the mackintosh, leaving him wrapped in the other two blankets and covered with the bedclothes, for an hour. Rub him down with hot towels, re-dress him, and remove the remaining two pack blankets.

3. **Cold Pack or Ice Pack.**—*Requisites.*—Mackintosh sheet; two sheets; twelve towels; small bath; wringer; cold water; ice; brandy and water; medicine glass; clinical thermometer.

Method.—Place one sheet on the mackintosh and roll it under the patient; strip and leave him covered with a sheet. Soak the towels in cold water with ice and wring out as required. When ready, wrap the patient's limbs in the towels, using one or two towels to each limb, one over the chest and abdomen and one under his back. Cover him with a sheet and renew the towels constantly as they become warm, using those left in soak. Ice may be rubbed over the towels on the arms and legs if there is much difficulty in reducing the temperature; caution is necessary, as this method may produce great shock. Take the patient's temperature (p. 192) at the commencement of the packing and every 10 minutes subsequently; watch the pulse carefully. Have a blanket at the fire and hot-water bottles in readiness. Duration of pack, ½ to 1 hour. Remove the patient from the pack when the temperature is a couple of degrees higher than that to which it is desired to reduce it. In the event of any symptoms of shock, remove the patient from the pack, apply the hot blanket and hot-water bottles and give a tablespoonful of brandy in hot water. When taking the patient out of the pack, remove the wet towels, dry and re-dress him, and leave him covered with a sheet and a blanket. Take the temperature, pulse, and respiration in an hour's time if the patient is not sleeping.

Cold and Tepid Sponging.—This form of treatment is often prescribed to reduce temperature in cases of pyrexia or hyperpyrexia (p. 195).

Requisites.—Long mackintosh; two washing blankets or bath sheets; towels; a large sponge; can of cold water; ice and ice-bag; bath thermometer; clinical thermometer; two washing basins, one containing water at the prescribed temperature; hot bottles; warmed blanket.

Method.—Prepare the patient as for blanket bathing (p. 11). Apply the ice-bag to the head, or a cloth wrung out of cold water may be used. Take the patient's temperature and pulse. Having brought the water in the basin to the correct temperature, soak the sponge. Sponge the patient in long single strokes, exposing each limb in turn, then the chest and abdomen, using the sponge very wet and squeezing it into the empty basin before redipping it into the water; this should be done after each stroke of sponging. Divide the time equally between the limbs; for the last five minutes turn the patient and sponge the back. Regulate the temperature of the water by adding either cold water or ice as required. The bath thermometer should be kept in the water. When finished, take the temperature and pulse again. If the temperature has not been reduced to the desired degree, start again; sponge for 10 minutes, then take the temperature and pulse once again. Sponging is usually ordered for 15 to 20 minutes, or until the temperature has been reduced a certain number of degrees. Unless contra-indicated or otherwise ordered, the sponging should be continued until the temperature has fallen to one degree above that to which it is desired to bring it. When finished, gently dab the patient over with a dry towel, remove the mackintosh and bath sheets, put on the gown, and leave covered with a sheet and one thin blanket. Take the temperature and pulse at the end of half an hour unless the patient is asleep. Should the patient show signs of collapse during the sponging (cyanosis, weak pulse, shivering), stop sponging, dry him with a warm towel and cover with warm blankets; place hot bottles in the bed and administer a hot drink, either hot tea, Bovril, or milk.

Tepid sponging.—Start with water 90° F., cooling down to 70° F.

Cold sponging.—Start with water 70° F., cooling down to 50° F. or lower.

BATHS

1. **Hot-air Bath.**—*Apparatus.*—Allen's apparatus, consisting of a long cradle, a kettle with an iron pipe or chimney, stand for kettle containing a spirit stove or electric hot-air bath kettle (Fig. 51); or an electric radiant heat cradle (Fig. 52) consisting of a full-length cradle fitted with electric light bulbs; or an improvised apparatus consisting of three small cradles, a steam kettle with a long spout, a kettle stand and spirit stove.

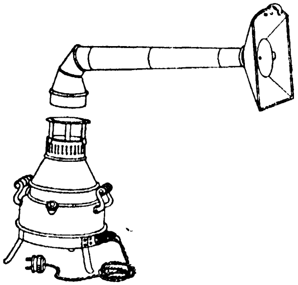


FIG. 51. Electric hot-air bath kettle.

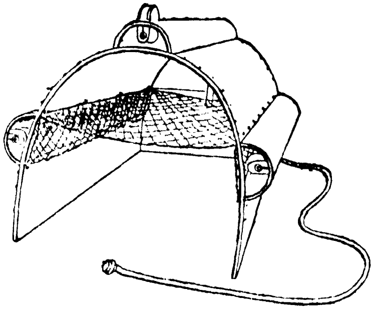


FIG. 52. Electric radiant heat cradle.

Requisites.—Two long mackintoshes; two blankets; towels; bath thermometer; bucket of sand; ice-bag or cloth wrung out of cold water.

Method.—Prepare the patient as for blanket bathing (p. 11), leaving him lying on and covered with a blanket; place the cradle over him reaching from neck to feet; cover the cradle with an asbestos sheet or mackintosh and one blanket, then the bedclothes, placing the sheet immediately beneath the quilt. Fold in the bedclothes at the foot of the bed so that they reach to the end of the cradle only. Withdraw the upper blanket left next to the patient and place it with the patient's shirt in front of the fire. Put the bath thermometer inside the cradle where it may be easily got at (in the illustration the thermometer hangs at the foot of the cradle, the upper half of which is hinged so that it may be opened to see the thermometer). Tuck the blankets round the patient's neck and place a towel over, then under, his chin. Apply the ice-bag or the cold wet cloth to his forehead. Turn on the current if the electric bath is in use, otherwise fix the funnel into the hole at the foot of the cradle, the other end fitting into the kettle, switch on the current, or light the spirit lamp. During the bath give the patient frequent hot drinks and wipe his face from time to time. Never leave the room whilst the patient is in the bath. The bath is continued until the required temperature has been maintained for the prescribed time. When finished, turn off the heat. Get an assistant to hold the blankets at the top, grasp the lower end of the cradle with the mackintosh covering it and withdraw them, allowing the blankets (which are hot) to fall over the patient. Leave him covered in this way for an hour, then rub him down with hot towels, put on warmed shirt and the warm dry blanket, removing the under mackintosh and blanket, also the upper blanket which was next to the patient. In this way the two bath blankets and mackintoshes are removed, leaving the usual bedclothes. Tuck in the bedclothes and leave the patient comfortable. Duration of bath, 30 to 60 minutes. Temperature 120°–130° F.

2. **Steam or Vapour Bath.**—May be given in the same way using steam instead of hot air, but two alterations in making the bed are necessary. An old blanket covers the cradle before the mackintosh is used and is required to absorb the moisture and so prevent the steam condensing and dropping on the patient: a small blanket covers the feet to prevent the steam scalding the feet as it enters the cradle. The electric cradle cannot be used. Temperature of steam bath 100°–140° F.: duration 30–60 minutes.

3. **Hyperthermia** is one of the means used to cause pyrexia and hyperpyrexia as a cure in certain diseases: muscular rheumatism (p. 310), neuritis (p. 365), sciatica (p. 366), asthma (p. 249), chorea (p. 389), rheumatoid arthritis (p. 311), disseminated sclerosis (p. 379), and others. Constant nursing care is needed throughout the treatment which takes eighteen hours.

Requirements.—An extra mattress so as to raise the patient six inches from the wire spring of the bedstead; an electric blanket, electric fan; Sorbo rubber pads for heels and buttocks; a sheet of turkish towelling 6 ft by 9 ft and batiste the same size; lint; the insulated bag which is made of non-rubber waterproof canvas interlined with lamb's-wool, with zip fastening down one side and on the shoulders, or, as a substitute, seven blankets may be used; two half-minute thermometers; bicarbonate of soda; glycerine; ice and ice pick; iced water, lemons, oranges, glucose, lemon-squeezer, knife, spoon and feeding cup; saline solution; catheter, tubing and funnel; hypodermic tray with the sedative and stimulants ordered, with methylated ether instead of iodine for swabbing the skin.

Preparatory treatment.—A light meal is given the evening before, no alcohol is allowed. On the day of treatment a glass of orangeade with glucose is given early in the morning. The urine is tested, an enema given, and the patient is weighed.

Treatment.—The patient lies on a bed with an extra mattress with a space of 6 inches between the patient and the bed-rails. The Sorbo pads, dusted thickly with bicarbonate of soda, are bandaged on the heels, and the larger ones placed under the buttocks. The night-gown is removed and bed socks and cotton gloves are put on. The patient is then enveloped in the turkish towelling, sheet of batiste, and a blanket and then placed in the insulated bag. The coil is then placed over the abdomen and the current switched on. When the patient's temperature rises to 101° F., the sedative ordered, usually omnopon one third grain, is given. The temperature usually rises one degree every 15 minutes. When the desired temperature is attained, the coil is disconnected and removed, the pyrexia being maintained for six hours.

A temperature of 105°–106° F. is sufficient in disseminated sclerosis, but in certain other cases it may be maintained between 106°–107° F. If the temperature tends to fall an electric blanket is placed inside the bag for a short time. Whenever awake, the patient is given orangeade, iced water, or saline to drink. At the end of the period the bag is opened and removed, the patient is then stripped and sponged all over with iced water, dried lightly, and left covered with a sheet only for a short time. When the temperature becomes normal, the bed is made in the usual way and the patient left to sleep.

If, during the treatment, the patient's temperature rises above the level ordered, the bag is opened and the patient's chest rubbed with ice, if this does not check further rise, the bag is removed, the patient stripped, the electric fan turned on and the patient is rubbed all over with ice, the spine receiving especial care. The temperature may thus be reduced from 108°–98° F. in a few minutes. In cases of collapse, Coramine and camphor are useful stimulants to have at hand.

During the treatment, the temperature and pulse are charted every 15 minutes, the respirations being carefully noted. The temperature is taken by mouth, the thermometer placed between the upper gum and the lip, every 15 minutes, by rectum every hour, The small side opening in the bag allows of easy access for insertion of the rectal thermometer without disturbance.

The lips are moistened with glycerine from time to time as a prevention against herpes. The patient is weighed the following day (allowed up if he was previously up) and may go home, returning in a week or four days for another treatment.

Another method of treatment by *hyperthermia* is by malarial inoculation which produces a mild attack of malaria (see p. 324).

4. **Aerated Bath.**—The bath is three-quarters filled with water and air under pressure is passed into the water by a special electric pump to the air distributor which is placed at the bottom of the bath. Temperature of the water 85°–90° F.

5. **Foam Baths** may be used for various purposes, the procedure differing according to the purpose for which the bath is ordered, the main purposes being: (1) To produce activity of the skin as in chronic rheumatism and neuritis. Temperature of water 115° reduced to 98° F. (2) To stimulate the cutaneous circulation, relaxing the blood vessels and resting the heart, used in certain diseases of the heart and raised blood pressure (hyperpiesis). Temperature of water 85°–95° F. (3) To stimulate metabolism, soothe mental irritability and relieve insomnia, in overwork and mental strain, nervous affections, neurasthenia, and some mental disorders. Temperature of water 65°–75° F.

Method.—(1) One or two ounces of the foam-producing product is put into a small quantity of hot water at the bottom of the bath. An air distributor is placed on the bottom of the bath and covered with 3–4 inches of hot water, temperature 115° F. Air under pressure is then passed into the water containing the foam-making extract until the bath is three parts full of foam. When the water in the bath has cooled to 98° F. the patient gets in. As he becomes accustomed to the heat of the foam bath, the temperature of the water at the bottom of the bath is increased. The patient remains in the bath for half an hour, or the time prescribed. He perspires freely during the bath and requires to have his face wiped frequently by the nurse with a warm towel. If required and allowed he may be given a warm drink. After half an hour the patient is taken out of the bath, wrapped in warm blankets and allowed to rest lying in the blankets for one or two hours. During this time warm drinks are given. After the rest-time expires the patient is sponged down with warm water, dried and clothed.

(2) *Carbon dioxide foam bath.*—The bath is prepared as in (1), but carbon dioxide is substituted for air under pressure. The temperature of the water is 85°–95° F. After lying in the bath for a short time, relaxation of the vessels causes lowered blood pressure, the heart's work is lessened, resulting in slowing and softening of the pulse beat, pulsation in the blood vessels in the neck is lessened, the patient feels soothed and inclined for sleep. The bath is prescribed in certain cases of heart disease and high blood pressure.

(3) *Oxygen foam bath.*—Oxygen used in conjunction with foam has a sedative action and may be employed instead of carbon dioxide. The sedative action is much increased if the water is cool, 65°–70° F.,

the patient remaining in the bath one to two hours. Cold is not felt as the foam prevents loss of body heat unless sweating takes place as in (1).

On removal from the bath the patient is rubbed down with warm towels and made to rest lying down in bed for one to two hours and allowed to sleep.

Patients having any of these baths require constant attendance, with intelligent observation by the nurse as to the patient's colour, pulse, etc. Should any shivering occur, the patient should be immediately removed and wrapped in warm blankets and given a warm stimulant. Drinks may be given both during the bath and rest hours unless countermanded. The patient is wrapped in warm blankets.

7. Saline Bath for Burns, see p. 100.

8. **Hot and Cold Reclining Baths.**—*General rules.*—Never leave the patient alone in the bathroom with the door locked; patients should not be left unattended whilst in the bathroom unless quite well. Prepare the bath and take the temperature before allowing the patient to get in. Always place cold water in first, adding hot water to the correct temperature. Do not fill the bath more than half full of water. If the bath is given for treatment and it is necessary for the patient to remain in it for some time, a blanket should be pinned round the shoulders and spread over the sides of the bath, another blanket being used to cover the bath. Hot water must be added from time to time to keep up the temperature.

9. **Bath Tank or Continuous Bath.**—This bath is used when the patient is kept in the bath continuously, for either hours, days, or weeks. The tank commonly used in hospital is a large reclining bath on wheels, fitted with a waste tap. A frame 8 inches deep is made to place inside the bath, resting on the bottom. Canvas is laced to the frame, which is tightly wedged against the sides of the bath to prevent it floating. A head rest is made of light wood and laced across with cord, upon which an air pillow is placed. Three-fourths of the bath is covered with a light wooden lid in sections; over this a mackintosh and blanket are laid. A thermometer is hung inside the bath so that the bulb is under water. The remaining fourth of the bath is covered with a blanket in which a slit has been made for the patient's head to protrude. One pint of peroxide of hydrogen is usually added to the bath of 70 gallons.

Temperature of bath.—During the day 95° F., during the night 97° F. unless otherwise ordered.

To regulate the bath.—This requires care and is done as follows: A small cylinder containing 8 gallons is used. Two gallons of water at a temperature of 120° F. are sufficient to raise the bath

1° F. The hot water on entering must be well diffused; this is accomplished by allowing the water to enter through a piece of rubber tubing with a large metal funnel at one end and a flat spray at the other. The end with the spray is placed at the bottom of the bath; by this means the water is circulated until the required temperature is attained. The bath is emptied every 12 hours; the patient is placed in bed whilst it is being done. The patient's bowels and bladder are attended to during this time to prevent disturbance while in the bath.

Temperature of baths.—Cold, 50°–65° F.; cool, 65°–75° F.; temperate, 75°–85° F.; tepid, 85°–92° F.; warm, 92°–100° F.; hot, 100°–112° F.

10. **Medicated Baths.**—May be either acid, alkaline, stimulating, emollient, or disinfectant.

a. ACID BATHS.—(1) Dissolve ℥iv of hydrochloric acid in a bath of 30 gallons of water. Temperature 92°–100° F. (2) Use 8 ounces of vinegar to a gallon of hot water. Temperature 92°–100° F.

b. ALKALINE BATHS.—(1) Dissolve 1 ounce of carbonate of sodium in every 7 gallons of hot water. Temperature 100°–112° F. (2) Take ½ lb. of borax or bicarbonate of soda and dissolve in 30 gallons of hot water. Temperature 100°–112° F.

c. STIMULATING BATH.—*Mustard bath.*—Mix, according to the strength required, 2–4 ounces of mustard into a smooth paste with warm water. Add it to 4 gallons of warm water. Temperature 92°–105° F.

d. SEA SALT BATH.—Dissolve 7 lb. of sea salt in 30 gallons of water. Temperature 85°–95° F.

e. EMOLLIENT BATHS.—(1) *Bran bath.*—Put 2 lb. of bran into a muslin bag and pour boiling water on to it, leave to soak for half an hour, squeeze well, then add the fluid to 30 gallons of water at the required temperature. Temperature 92°–100° F.

(2) *Starch bath.*—Take 2 lb. of starch and mix with sufficient cold water to dissolve it; add boiling water until it is of the consistency of thick mucilage. Pour into a bath of 30 gallons of water at the required temperature. Temperature 92°–100° F.

(3) *Iodine bath.*—May be given as a partial or regional bath (p. 570) and is used to stimulate slow healing ulcers or wounds. To 6 gallons of hot water add 1 ounce of liquor iodi mitis.

(4) *Oatmeal bath.*—Put 3 lb. of oatmeal into a muslin bag; infuse in the same way as for bran, then add it to 30 gallons of water at the required temperature. Temperature 92°–100° F.

(5) *Boric acid bath.*—Take a saturated solution of boric acid and heat to the required temperature, or add an equal quantity of hot water to the saturated solution. Temperature 92°–105° F.

f. DISINFECTANT BATHS.—(1) *Sulphur bath.*—Dissolve ℥iv of potassa sulphurata in 30 gallons of hot water. Temperature 92°–100° F.

(2) *Carbolic bath.*—Take ℥x of pure carbolic acid, add it to 5 gallons of water. Temperature 92°–100° F. Dissolve the pure carbolic in 2 quarts of boiling water, then add 4 gallons of water, making it the correct temperature.

(3) *Mercury bath.*—The strength commonly ordered is 1–8000, obtained by dissolving 15 full-strength solubes (B.P.) of mercury in 30 gallons of water.

PREPARATION OF SPECIMENS FOR BACTERIOLOGICAL EXAMINATION

To obtain and prepare material for bacteriological examination the following instruments are necessary, and require to be thoroughly sterilized immediately before and after use.

1. Pieces of platinum wire, about 3 inches in length and sufficiently stout not to bend readily, are mounted in metal holders.

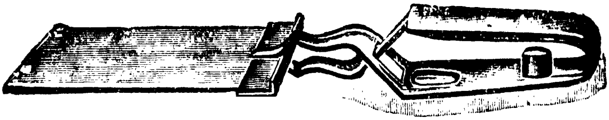


FIG. 53. Cornet's slide forceps.

Some of these have their ends curved in a small *loop*, others are straight with the end somewhat flattened (*needles*), and others have the end bent at right angles to the wire. They are sterilized by heating in the flame of a spirit lamp until red-hot, and are allowed to cool before use. After use they are again heated in the flame.

2. Swabs for collecting material from infected tissues consist of stiff copper wire about 7 inches long, with a flat loop made at one end, round which a small piece of absorbent cotton wool is twisted. A test tube about 1 inch shorter than the wire is then selected and its mouth plugged with a stopper of cotton wool through which the wire passes. It is then sterilized by dry heat (p. 829).

3. Culture tubes. A culture tube consists of a test tube in which a sterile medium has been placed. The medium may be either solid or fluid; when solid, it is placed in the tube in such a manner as to form a long slanting surface. The mouth of the tube is plugged with dry, sterile cotton wool.

4. Small sterilized glass pipettes.

5. A hypodermic syringe and needles. These may be sterilized either by boiling in oil or water (p. 44). When the latter is employed the needles should be immersed in spirit to prevent them becoming rusty.

6. Slides and cover slips are cleansed in Van Ermengen's solution,

or they may be washed with soap and hot water, boiled, and kept immersed in spirit in a covered glass jar.

7. Forceps. Useful forceps for holding slides and cover slips are known as Cornet's (Fig. 53). If proper forceps are not obtainable, dissecting forceps may be used.

8. Spirit lamp.

Specimens may be prepared for examination either in the form of 'smears' or by the 'hanging drop' method.

To prepare Films.—*Smears.*—A small amount of the material to be examined is picked up on a platinum loop, or swab, and smeared over the surface of the slide. If the specimen is thick and tenacious it may be diluted by first placing a drop of distilled water on the slide; alternatively a thin even film can be produced by placing a small portion on one slide and pressing it flat with a second slide, and then separating the two slides by pulling them apart with a gliding motion. The smear is then exposed to the air to dry it, or it may be held well above the flame of the spirit lamp, film upwards, until the excess moisture has evaporated. Next it is 'fixed' by passing the slide, held film upwards, through the flame of the spirit lamp; it is then ready for staining. The proper stain is allowed to flow over the smear, and left in contact with it the required length of time. Heat may or may not be used subsequently according to the nature of the specimen and the stain used.

The hanging-drop method (p. 832).—The bacteria must in this case be in a fluid medium; if the material is solid it is liquefied by the addition of a drop of distilled water. The drop of culture or pus is then placed on a cover-slip. A glass slide in which a small depression has been hollowed out is needed. The cover-slip is inverted over the depression in the slide, thereby allowing the drop to hang free between the slide and the cover-slip. If vaseline is smeared round the edge of the depression, the cavity is rendered air-tight and evaporation is prevented. It is also useful to prevent the cover-slip from moving.

Method of taking a Culture.—Taking a culture consists in obtaining an uncontaminated specimen of the material to be examined, placing it on a suitable sterile medium, and putting it in an incubator at the required temperature in order to promote the growth of any organism that may be present. (See bacteriology, p. 830.)

Requisites.—Sterilized swabs or platinum loop; spirit lamp; two culture tubes containing the desired media.

Method.—Pass the swab or platinum loop lightly over the infected area, then open the culture tube and introduce the swab or loop. The instrument is gently stirred in a fluid medium, or lightly drawn over the surface of a solid medium from below upwards, care being taken not to scratch the surface, and then withdrawn. The cotton-wool stopper is replaced after igniting it in the spirit flame in order to re-sterilize it.

Precautions.—The greatest care must be taken to render and keep the instruments used sterile. The swab or loop must not be allowed to come into contact with anything but the infected area, otherwise the culture will be contaminated and useless. Sometimes the culture is taken without any culture tubes, the swab or platinum loop being replaced in the tube after obtaining the culture. The mouth of the tube is then plugged with wool lighted in the flame of a spirit lamp and the specimen is sent to the laboratory immediately.

The following rules should be observed by nurses in the preparation of cultures and specimens: Never touch a specimen or culture with an uncovered abrasion (p. 519) or scratch on the hands. Wash the hands before and after handling specimens, etc. Do not handle cover-slips or slides without forceps. Always sterilize the platinum loop or needle immediately before use, also immediately after use before laying it down. Culture swabs must be burnt immediately after use unless replaced in a tube securely plugged with dry cotton wool.

Methods of obtaining a Specimen of Blood.—*Requisites.*—Sharp cutting needle; small piece of lint; spirit lamp; spirit; capillary tube.

1. *Method.*—Rub a lobe of the patient's ear with methylated spirit; this renders it clean and increases the blood supply and so causes the blood to exude more rapidly. Sterilize the needle in the spirit flame and prick the ear sharply. Place the end of the sterilized glass tube in the blood which exudes, squeezing out more blood if required. When sufficient has been procured allow the blood to flow into the middle of the tube away from the end. Seal the end by holding it in the spirit flame. Care must be taken to avoid heating the blood or the specimen will be spoilt.

2. In some cases it is necessary to obtain the blood directly from a vein; this is only done by the pathologist (p. 124).

Requisites.—Sterilized hypodermic or aspirating (Fig. 35) syringe and needle or large-bore vein puncture needle with a short length of rubber tubing attached, spirit or other necessaries for purification (p. 437); wool, collodion, bandage.

Method.—The median basilic vein is the one commonly selected. The site of the puncture is purified (p. 437), and the arm is bandaged above in order to render the vein prominent. The needle is introduced through the skin into the vein, the bandage is loosened, and the required amount of blood is aspirated. The puncture is then sealed with wool and collodion.

THE COLLECTION OF SPECIMENS FOR PATHOLOGICAL EXAMINATION

For a satisfactory examination all material must be absolutely fresh and uncontaminated. Whenever possible, specimens should be sent by hand as soon as they are collected rather than by post.

Sterile bottles, containers, and tubes are best obtained from the pathologist or laboratory; a supply is always available.

Tissues, such as tumours, etc., if for histological examination only (and not for bacteriological examination by culture) should be fixed at once in 5 to 10 per cent formalin. If the finer cellular structure has to be investigated, pieces should also be fixed in *saturated corrosive sublimate* in normal saline (not in ordinary corrosive lotion). Spirit is not satisfactory for fine work, as it causes shrinking of the tissues, but may be used when other fixatives are not available. It is also necessary to supply a concise résumé of the clinical history of the case, age and sex of the patient, etc.

Sputum should be collected on the morning of examination, immediately on waking and before breakfast. The patient should be instructed to brush the teeth, then to rinse out the mouth with sterile water, and to be certain that the sputum is brought up from the chest, and so avoid collecting merely saliva, or mucus from the back of the throat or pharynx—unless the latter exudates are actually to be examined, as may be the case. At least 5–10 c.c. (one to two teaspoonfuls) of sputum, including especially any denser portions, if present, should be obtained when possible. The patient should be told to expectorate directly into the tube or bottle, avoiding contaminating the exterior; no water or other fluid, and no antiseptic of any kind, should be added. Great care must also be taken not to touch or contaminate the portion of cork which goes into the bottle. Specimens of sputum of young children may be obtained from the back of the throat by means of a sterile throat swab.

Pus and other Inflammatory Exudates and Morbid Fluids should be collected into a sterile rubber-stoppered bottle, or, if the quantity is small, in a sterile pipette, or on a sterile throat swab. When a swab is used it is advisable also to make three films on slides (p. 119) either with a second swab, a platinum needle, or in some other way, especially in cases of gonorrhoea. If only one swab is available, and if it is used for this purpose, the slides must first be thoroughly sterilized in a flame and allowed to cool, otherwise the swab will be contaminated. If such films are not made, a satisfactory study of the cellular characters of the exudate will not be possible if the swab has become dry by the time it is received by the pathologist. Certain fluids, especially pleural fluids, which are liable to coagulate should be taken to the laboratory immediately by hand before this has time to occur. Should this be impossible a little sterile sodium citrate solution (which is supplied on request) should be added to the specimen after its withdrawal.

Throat Swabs.—In cases of suspected diphtheria, etc., throat swabs are taken as follows: undo the protecting cotton wool round the top of the tube, withdraw the swab from the tube, and apply firmly to the affected part, so as to remove some of the exudate or membrane. A sterile small sharp spoon is useful for making scrapings from ulcers, etc., of the tonsils or other parts, in cases of suspected syphilis, Vincent's angina, etc., as well as in diphtheria. The spoon may be kept in a tube of absolute alcohol, which may be burned off immediately before use, and the material either sent on the spoon in a sterile tube or transferred to the tip of a throat swab for transmission. The specimen should not be collected immediately after the throat has been treated with an antiseptic. Care should be taken that the swab or spoon does not touch the tongue or cheek during the procedure. When re-inserting into the tube, avoid touching the lip and the side of the tube.

Vaginal Swabs, etc.—One swab should be made through a sterile speculum, directly from the os uteri; another from any discharge that can be expressed from the urethra, after the surface contaminating organisms, etc., have in both instances been thoroughly wiped off with a sterile surgical swab. A third swab may be made from the general vaginal discharge, if its character is also to be determined; but it is useless, in the majority of cases, to examine this alone.

Urine.—(*a*) If for chemical examination only, 6–8 ounces of the mixed 24-hours urine should be sent, together with a note of the total amount passed. It is occasionally advisable to keep the urine excreted during the day and night separate.

(*b*) If a microscopical examination is required, freshly passed morning urine is usually preferable. It should be noted that such examination is often vitiated by the presence of extraneous matter, especially vaginal discharge, it is therefore necessary to cleanse the external genitals before the specimen is passed (see p. 12).

(*c*) If a complete bacteriological examination by cultivation is required, a sterile bottle must be used, and is supplied on request. The cork and neck of the bottle are protected against dust and contamination, and the wrappings should be carefully kept sterile and replaced after the specimen has been collected. The meatus and surrounding parts should be thoroughly cleansed with Lysol or corrosive sublimate lotion after washing with soap and water. For a reliable bacteriological result a catheter specimen is absolutely essential in the female. The catheter (preferably two, in case of accidental contamination) should be boiled for at least 20 minutes.

An antiseptic lubricant should not be used. In the case of a female no lubricant of any kind is necessary; in the case of a male, sterile liquid paraffin or sterile vaseline is used. The first urine flowing should not be allowed to run into the collecting bottle. It is advisable to wear sterile rubber gloves during the process. The free end of the catheter should not be touched, and the mouth of the bottle very carefully preserved from contamination (see catheterization, p. 66).

Faeces.—The anus should first be cleansed with soap and water. The motion should then be passed into a clean bowl, which has been previously boiled for twenty to thirty minutes. Small portions of the motion should then be picked up on a sterile scoop from various representative parts of the material, any of the softer portions, and especially any jelly-like mucus, if present, being chosen, as these are most likely to contain pathogenic organisms. It is essential that the specimen should be received absolutely fresh—especially if there is any suspicion of the presence of protozoal parasites such as the entamoeba of dysentery. Even the delay of postage should be avoided if the specimen can possibly be sent by messenger. For bacteriological examination only, small portions left on the scoop are quite sufficient, the scoop being replaced in the sterile tube with them still upon it. If the bowels are constipated, a mild aperient should be given in the evening and a specimen collected and sent for examination on the next morning. For quantitative analysis for fats, etc., the whole motion passed should be thoroughly stirred up in the bowl in which it is passed in order that the sample taken will represent the whole in its composition. The tube should be three-quarters filled with the sample of the mixture. A note of the patient's diet for the previous few days should always be sent, and it is usually advisable that a mixed twenty-four hours' specimen of urine should also be submitted for examination. For 'occult blood test,' the collecting tube itself should be half to three-quarters filled with a sample of the mixture as described. No red meat should be taken for three or four days before the specimen is collected.

Stomach Contents.—The patient should be especially warned against swallowing any sputum, nasal discharge, or naso-pharyngeal discharges, as these complicate the investigation and sometimes render it useless. For the administration and removal of test meals see p. 31.

Blood Examinations.—(*a*) *Blood counts.*—The specimen of blood required for these is collected by the pathologist himself.

(*b*) *Blood films*, to be examined for malarial parasites, etc., or for differential leucocyte counts, or for general examination, apart from quantitative or absolute numerical counts, should be made on carefully cleaned slides—a minimum of four slides being sent, in order to allow different staining methods to be applied, and to obtain a good average result. An absolutely freshly exuded drop of blood should be used for each film, the ear or finger being wiped clean of old blood before each film is made. The small drop of blood is placed towards one end of a slide, care being taken not to touch the patient's skin with the slide. The drop is then immediately drawn out with the end of another slide. The end of the spreader must be carefully wiped before each film is made. A thin even film is necessary, and should be allowed to dry in the air, aided if necessary with gentle heat, but not near a flame. When quite dry the films may be placed face to face and wrapped in paper. Blood counts should be made *before*, not after a meal, preferably about noon—in order to avoid the period of post-digestion, leucocytosis, etc.

Blood for Wassermann Examinations is best drawn directly from a vein into a sterile rubber-stoppered tube supplied for the purpose. A large-bore puncture needle to which a small length of sterile tubing is attached is used, the end of the tubing being placed in the tube. At least 5 c.c. should be sent. The tube should be kept upright and allowed to stand until the blood has coagulated.

Blood for agglutinations (Widal reactions, etc.) is also collected by vein puncture, in the same way as for Wassermann's.

Blood Cultures are done by the pathologist direct from the patient.

Cerebrospinal Fluid obtained by lumbar puncture should be sent in the rubber-stoppered bottle supplied: a cotton wool plug may not be used. The fluid should be drawn off in two portions—the second, which is the major portion, being less likely to contain blood from the needle puncture itself. For lumbar puncture, see p. 86.

Examination for Spirochaeta Pallida and other Spirochaetes.—Mere surface swabs from the primary sore or from ulcers on the tonsil, etc., are insufficient. Whenever possible the pathologist should himself collect the material from the patient, but if the specimen has to be transmitted to the pathologist the following method is used: The base and edges of the sore are cleaned with a swab soaked in absolute alcohol or spirit. This procedure will generally cause serum to exude, but if not, light scraping of the sore with a sharp sterile spoon may be made, but care should be taken not to cause bleeding. The exuded serum is drawn up into a capillary vaccine tube, or the capillary portion of a sterile glass pipette, and the ends sealed in the flame—carefully avoiding heating the specimen itself. The upper empty portion of the vaccine tube should first be gently warmed and the end then sealed. On cooling, the fluid will be drawn upwards, and the lower end may then be sealed.

Reservation of Specimens for Inspection, see p. 30.

VARIOUS TESTS USED IN DIAGNOSIS

Basal Metabolic Rate (B.M.R.).—The foodstuffs absorbed from the intestines are carried by the blood to the tissues and used by them to supply the energy required for their various functions and also to form new cells. This utilization of food substances is called 'Metabolism,' which is a form of combustion by oxidation necessitating the intake of oxygen and resulting in an output of heat and carbon dioxide.

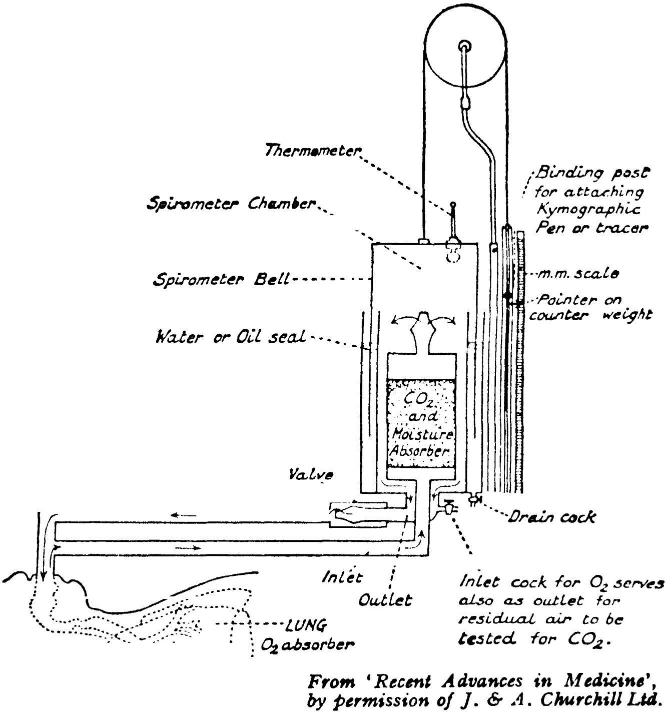
The degree of metabolism, or the *metabolic rate* as it is termed, is gauged by estimating the gaseous exchange by measuring either the volume of oxygen consumed or the amount of carbon dioxide exhaled from the lungs, or by determining the amount of heat given off by the body (calorimetry).

Since the metabolic activity of the body varies under different states, being increased by muscular exertion and after a meal, and decreased during sleep and by starvation, it is necessary to perform the test under standard, or basal, conditions if a comparison is to be made of the metabolic rates of healthy and diseased persons. Basal metabolism is obtained when the patient is lying down at complete physical and mental rest and has had no food for 12–18 hours.

When a patient's basal metabolic rate is going to be estimated he should preferably be admitted to hospital for the night, but if he is an out-patient he should be instructed to arrive with the minimum of exertion, having abstained from food for at least 12 hours. On arrival he should be made to lie down on a couch in a warm and quiet room, and forbidden to read, talk, write or smoke, and told to relax as far as he is able; about one hour should be passed in this way before commencing the test.

Method.—The simplest method of estimating the B.M.R. is by means of the Benedict portable apparatus, the essentials of which are shown in the diagram (Fig. 54). As can be seen, the air circuit is entirely closed, the patient breathing in oxygen from the spirometer and breathing out carbon dioxide, which is absorbed by the soda lime contained within the apparatus.

The mouthpiece with tubes attached is fixed on the patient, and his nose clipped to prevent breathing by that route. When he is breathing naturally the volume of oxygen is read on the dial and the time noted, and the test allowed to proceed for a period of 4–7 minutes when the volume of oxygen is again read. A duplicate test is generally made. From the total volume of oxygen consumed during the two test periods can be calculated the number of c.c. used per minute. From this date, together with the patient's height, weight, age, and sex his B.M.R. is estimated by means of tables. This is then compared with the B.M.R. of a normal person of the same height, weight, age, and sex, and the result expressed as a percentage increase or decrease of the normal.


Thermometer
Spirometer Chamber
Spirometer Bell
Water or Oil seal
Valve
Binding post for attaching Kymographic Pen or tracer
m.m. scale
Pointer on counter weight
CO_2 and Moisture Absorber
Drain cock
Inlet
Outlet
LUNG
O_2 absorber
Inlet cock for O_2 serves also as outlet for residual air to be tested for CO_2.

From 'Recent Advances in Medicine', by permission of J. & A. Churchill Ltd.

FIG. 54. The Benedict portable apparatus.

Blood Sedimentation Rate.—If a tube of citrated blood is stood up vertically, it will be noticed that the red corpuscles gradually settle by gravity leaving a clear supernatant fluid. The rate of this sedimentation is much more rapid in certain diseases than in health. A high sedimentation rate occurs in all acute infections, being greater the higher the temperature, and in tuberculosis, rheumatic fever, and rheumatoid arthritis, in which as improvement takes place so the sedimentation rate gradually decreases in rapidity and finally returns to normal when the disease has become quiescent or cured.

There are several ways of performing the test, but perhaps Wertergren's method is the one most commonly used.

Method.—Having taken 1 c.c. of 3·8 per cent sodium citrate solution into a 5-c.c. syringe, an arm vein is entered (p. 81) and blood drawn up to the 5-c.c. mark: the contents are then expelled into a small test tube and mixed by inversion. A sedimenting tube like a straight pipette, 30 cm. long and having a bore of 2·5 mm., is filled with the citrated blood up to a mark scratched at 200 mm. from the end, and then placed in an upright position in a special rack which holds the lower end firmly pressed on a pad of rubber by means of spring pressure on its upper end. The time is noted and readings made at the end of one hour and two hours by measuring the length of clear supernatant fluid.

Using the 200 mm. column of blood, a normal sedimentation rate does not exceed 12 mm. in one hour.

Protein Skin Test.—The whole of the patient's arm from shoulder to elbow is washed with spirit and allowed to dry. A series of small scratches, about 5 mm. long, and not deep enough to draw blood is then made on the skin of the arm, and a small drop of protein preparation is applied to each scratch. A different kind of protein is applied to each scratch, and as many as 30 or 40 may be tried at one sitting. To one of the scratches a small drop of inert fluid (e.g. normal saline) is applied. If the patient is not sensitive to the protein all the scratches, including the control, will remain the same in appearance. If the patient is sensitive to one or more of the proteins used, the scratch to which it is applied will become surrounded by an area of redness, and in some cases of great sensitivity a wheal may form around the scratch. The reaction generally appears in about twenty minutes, and may last several hours.

The Intradermal Method.—This method is only used after a skin scratch test has been made, as serious general reaction may occur if the patient is very sensitive.

Intradermal injections are made into the skin with the least amount of fluid possible which can raise an elevation, about 0·02 c.c. A dilution of ten to one hundred will give a positive test when given intradermally. This method is particularly useful in cases of bacterial sensitization, in which cases skin-scratch tests are usually negative.

Glucose Toleration Test.—Not less than four hours after food the patient must pass urine, and 10 c.c. of blood are collected for the estimation of blood sugar (p. 120).

The patient is then given 50 grammes of glucose in 200 c.c. of water, and for the next two or three hours blood and urine specimens are collected at half-hourly intervals. Each specimen is labelled with the patient's name, the time and the quantity obtained, and sent to the laboratory for examination.

Blood Urea Test.—The blood for this test should be collected first thing in the morning, for preference fourteen hours after the last meal. 10 c.c. of blood is withdrawn from a vein (p. 120) and sent to the pathologist. It is sometimes an advantage to collect some urine from the patient at the same time, so that the amount of urea in the blood can be compared with the amount in the urine. The blood of a normal patient should not contain more than 40 mg. of urea in every 100 c.c. of blood serum.

The **Schick test** determines the susceptibility of a person to diphtheria. The **Dick test** determines the susceptibility of a person to scarlet fever. The **Schick test** is performed as follows: A small quantity of diphtheria toxin is injected *intradermally* (see intradermal injection) into the front of one forearm, and into the other a control of inactive toxin (toxin destroyed by heat). The control is necessary as the protein in the toxin, and not actually the toxin, may cause a reaction.

A *positive reaction* is shown by a sharply defined raised area of redness of a diameter of a half to one inch appearing on the test arm within 24 hours, reaching a maximum in 72–96 hours, and followed by desquamation, while the control arm remains unaffected.

A *negative reaction* is shown by both arms remaining unaffected.

Pseudo reaction. If an area of redness appears rapidly and equally on both arms in 24 hours with disappearance in four days, the reaction is due to the protein in the toxin and the test is negative.

Combined reaction. A pseudo reaction occurs on both arms, fading in four days on the control arm, but becoming bigger and redder on the test arm. In this case the test is positive.

The **Dick test** is performed in a similar manner but using the toxin produced by scarlatinal strains of haemolytic streptococci. The positive reaction appears in 3–4 hours, reaches its maximum in 18–36 hours, and subsides in 48 hours.

Schultz-Charlton reaction, or the Blanching Test for scarlet fever, is used as an aid to diagnosis in doubtful cases exhibiting a rash.

At the height of the eruption a small quantity of scarlet fever antitoxin is injected intradermally into a vivid patch of the rash.

Positive reaction. If the case be one of scarlet fever, an area the size of a florin around the site of the injection will become blanched, due to disappearance of the rash.

Negative reaction. No change of colour of the rash will occur. A negative reaction does not prove that the case is not one of scarlet fever, but a positive reaction makes the diagnosis certain.

CHAPTER IV

THE APPLICATION OF BANDAGES, EXTENSION, AND SPLINTS

BANDAGING

BANDAGES are used to retain dressings, splints, and applications in position, for support, to apply pressure, or to secure a limb in a required position.

Varieties of Bandages.—There are three kinds of bandages, viz. roller bandages, triangular bandages, and tailed bandages.

Roller Bandages.—*Materials.*—Muslin, gauze, unbleached calico, domette, flannel, flannelette, crinoline, medicated gauze, elastic, rubber, and crêpe velpeau. Muslin, gauze, and domette bandages are used over dressings. Calico, domette, and flannelette are employed to retain splints for support or for pressure. Flannel, to retain hot applications in place, when warmth is required, and under plaster of paris. Medicated gauze, for use as a dressing. Elastic and rubber used for support, pressure, and Bier's treatment (p. 104). Crinoline or coarse-meshed book-muslin for use with plaster of paris, and muslin of a fine mesh for water-glass. Crêpe velpeau, for support.

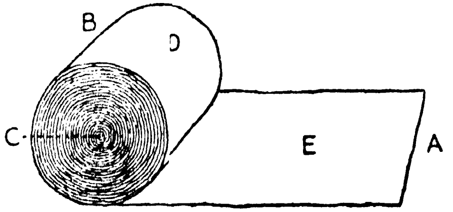


FIG. 55. Roller bandage.

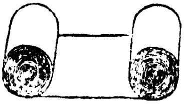


FIG. 56. A double-headed roller bandage.

Length, 4–8 yards; *width*, ¾–5 inches.

To make.—Remove the selvedge from the material; tear it into strips of the required width and length; remove all loose strands from the edges; roll evenly and tightly by hand or by machine; turn in the initial end and pin it neatly in place.

Description (Fig. 55).—A. The free end of the bandage is called the *initial end*. B. The rolled-up portion, the *head*. C. The rolled-up terminal extremity, the *tail*. D. The exposed surface, the *outer surface*. E. The surface in proximity to the roll, the *inner surface*.

A double-headed roller consists of two roller bandages of equal width which have had the ends stitched together; or of a long bandage rolled from either end towards the middle (Fig. 56).

Rules to be observed in roller bandaging:

1. Stand opposite the part to be bandaged and at the same side. Exception—the application of the capeline bandage.

2. Place and support the limb in the required position before applying the bandage.

3. Bandage from below upwards, and from within outwards, over the front of the limb. For exceptions, see below.

4. Fix the end of the bandage with the first turn; each succeeding turn should overlap two-thirds of its predecessor.

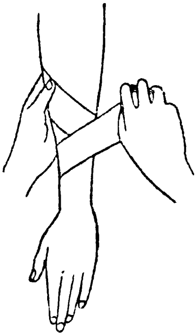


FIG. 57. To start and fix a bandage; the oblique method.

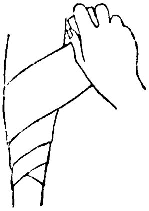


FIG. 58. The spiral figure.

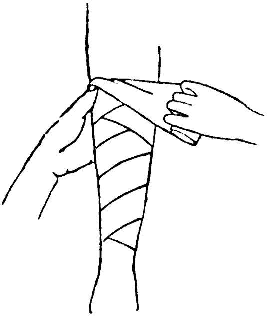


FIG 59. The reversed spiral figure.

5. Make no turn or knot over a bony prominence; pressure throughout must be uniform.

6. Keep all margins parallel, and let the crossings and reversings be in one line towards the outer aspect of the limb.

7. Finish by fixing the *tail* neatly and securely with a safety-pin or with a reef knot.

Exceptions to Rule 3.—The trunk is sometimes bandaged from above downwards. A limb is bandaged from without inwards in the following instance: When the limb is everted, as in fracture of the femur, talipes valgus, etc.

To Fix and Start a Bandage.—*The oblique method* (Fig. 57).—Hold the *head* firmly between the fingers and thumb, but not in the tips of the fingers, with the outer surface uppermost. Unroll the end for about 6 inches. Place the end on the inner and upper aspect of the limb about 3 inches above the desired starting-point and hold it in position. Bring the bandage obliquely downwards and outwards over the front of the limb, level with the desired starting-point, then beneath the limb, inwards and upwards over the front of the limb, crossing the previous turn on the outer aspect of the limb.

The Various Figures or Patterns used in Bandaging.—The three figures in use are (1) spiral, (2) figure-of-eight, (3) recurrent, each of which is subdivided into the following: 1. Spiral; reversed spiral. 2. Figure-of-eight; spica; divergent spica. 3. Recurrent; capeline.

1. (*a*) **Spiral.**—Used for limbs of equal dimensions.

Method.—Roll the bandage obliquely round the limb. A complete circular turn should not be taken (Fig. 58).

(*b*) **Reversed Spiral.**—Used for limbs in conjunction with spiral for the parts of the limb which vary in thickness.

Method.—As the spiral turn is brought over the front of the limb, fix it with the thumb, turning down the bandage obliquely over the thumb (Fig. 59), forming an inverted V pattern.

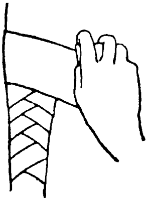


FIG. 60. Figure-of-eight pattern.

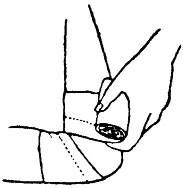


FIG. 61. To start a divergent spica bandage. The dotted line shows the edge of the first turn of the bandage.

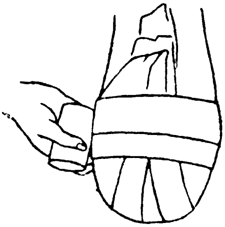


FIG. 62. Recurrent or Stump bandage, see p. 755.

2. (*a*) **Figure-of-eight.**—Used for joints, also for the limbs or the trunk when firm application is needed. It consists of a series of double loops over a limb.

Method.—Bring the bandage over the front of the limb, then obliquely upwards round the limb behind, and down over the front crossing the first turn (Fig. 60).

(*b*) **Spica.**—This is the name given to a figure-of-eight bandage applied to a joint which is at right angles to the trunk or limb, as in the case of the shoulder, hip, and thumb.

Method.—Apply as described for figure-of-eight, making one loop round the limb; the second loop, which will be much larger, is made round the trunk and brought down over the front of the limb to cross the first loop, thus making the pattern. (See shoulder spica, Fig. 69.)

(*c*) **Divergent Spica.**—Used for the heel and for a flexed elbow or flexed knee.

Method.—Take one turn over the tip of the point, bring the bandage down over the lower outer edge of the previous turn, under the limb, up, covering the lower inner edge, across the front of the limb, down over the edge of the spiral turn, across the front of the joint, and repeat (Fig. 61).

3. (*a*) **Recurrent Bandage.**—Used to cover in the tips of stumps, fingers, or toes. See also after treatment of stump (p. 755).

Method.—Take the bandage over the middle of the stump, starting from the centre of the limb, holding the ends on both aspects of the limb in position with the fingers of one hand. Take the bandage to and fro on either side of the centre turn, alternately, until the tip is covered; then apply a spiral or figure-of-eight bandage from the end of the stump as far as is necessary (Fig. 62).

(*b*) **Capeline Bandage.**—See head bandages (Fig. 63).

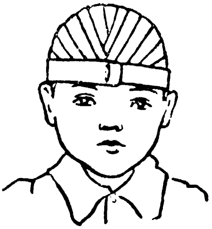


Fig. 63. Capeline bandage.

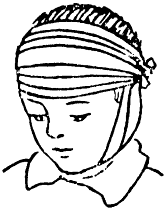


Fig. 64. The knotted bandage applied to the front half of the head.

Bandages for the Head.—1. **Capeline Bandage** (Fig. 63).—This bandage may be applied either to cover in the whole or one half of the head. Bandage (double-headed roller), 2 inches wide, 6 yards long (p. 129).

Method.—Stand at the back of the patient. Place the centre of the bandage in the middle of the brow and bring the heads round to the nape of the neck or as low as practicable. Cross one roll over the other, transferring them to the opposite hands, and pull them tight. Carry one roll upwards along the middle line over the head and down to the root of the nose (vertical bandage). Bring the other roll (horizontal bandage) round the head above the tip of the ear, making it cross, and thus fixing the vertical bandage at the root of the nose. Take the vertical bandage back across the head a little to the left of the middle line, fixing it as before with the horizontal bandage. Bring the vertical bandage over the head again to the right of the middle line and fix as before. Continue carrying the vertical bandage from before backwards on the left, and from behind forwards on the right, diverging each time from the middle line until the ears are reached. Cut off the vertical bandage and finish by taking one horizontal turn round the head and pin it in front. When only half the scalp is to be covered, the first turn of the vertical bandage is applied across the middle of the head, the second and succeeding turns being made to diverge from the middle across the half of the scalp to be covered. The horizontal bandage is applied as described for the capeline bandage. It is important in these bandages to bring the horizontal turns as far into the nape of the neck as possible to prevent the bandage from slipping.

2. **The Knotted Bandage** (Fig. 64).—Used to cover in either the front or back half of the head. Bandage, 2½ inches wide, 6 yards long. Use the two following figures alternately until the front half of the head is covered:

To start: Unroll 6 inches of the bandage and place immediately above and in front of the ear. *1st turn:* Take the roll across the brow, round the back of the head, over the protruding part or rather below it, to the starting-point. Twist with the end. *2nd turn:* Take the roll over the crown of the head, down behind the ear, under the chin and up to the starting-point, twist, and repeat No. 1. Each succeeding turn covers in a third of the preceding one on the part of the scalp to be covered, but is applied directly over the preceding turn in all other places. Finish by tying the ends in a reef knot at the starting-point. To cover in the back half of the head proceed as above, but make the bandage diverge when the back of the scalp is reached instead of the front. In cases of haemorrhage of the scalp, the twist in the bandage may be made over the site of haemorrhage.

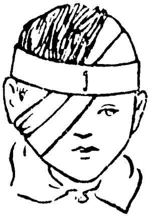


FIG. 65. Single eye bandage.

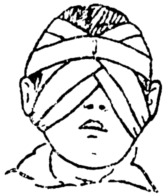


FIG. 66. Double eye bandage.

The Eye (Fig. 65).—1. Bandage, 2 inches wide, 6 yards long. *To start:* Place the end of the bandage above the ear on the same side as the eye to be bandaged. *1st turn:* Take the bandage horizontally round the head across the brow to the starting-point, and round to the opposite ear. *2nd turn:* Take the bandage obliquely across the back of the head, under the ear, over the eye towards the nose, over the head, then horizontally round to the starting-point. Continue these turns alternately, until the dressing is covered. One turn over the eye may be sufficient, or two or three may be required. Finish with the first turn, pinning the bandage in the centre of the forehead.

2. *Double eye bandage.*—Same bandage (Fig. 66).

To start: Make 1st and 2nd turns as before. *3rd turn:* Down over the uncovered eye, below the ear, obliquely up the back of the head, after which repeat No. 1 turn. The crossings should come over the nose. Finish as before.

The Ear.—1. Bandage, 2 inches wide, 6 yards long.

To start: Place the end of the bandage above the ear to be bandaged. *1st turn:* Take the bandage horizontally round the head across the brow to the starting-point and across the brow to the opposite ear. *2nd turn:* Bring the bandage obliquely down across the back of the head, over the ear covering in the lowest portion of the dressing, and up to the horizontal turn. Reverse the bandage, then carry the roll across the brow to the ear and continue with *turn* No. 1. Continue these two turns alternately until the dressing is covered. The turns over the ear diverge; the turns round the head cover each preceding turn. Finish with turn No. 1, pinning the bandage in the centre of the brow.

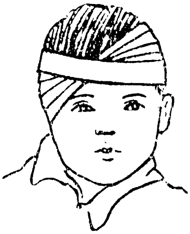


FIG. 67. Single ear bandage.

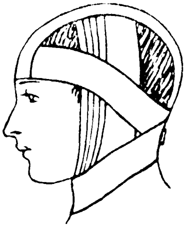


FIG. 68. Double mastoid bandage.

2. *Second Method* (Fig. 67).—Proceed as described for turns 1 and 2. When the bandage has been brought up over the ear in turn 2, instead of reversing the bandage on the brow it is carried over the side of the head to the back of the head, then round the head as far as the starting-point. Proceed with turn No. 1. The bandage diverges over the ear, and on the side of the head; the horizontal turns cover each preceding turn. Finish as before.

3. **Figure-of-eight Pattern for the Neck or Ear** (Fig. 68).—**Bandage, 2 inches wide, 6 yards long.**

To start: Place the end of the bandage on the top of the head, fix it by carrying the bandage towards the opposite ear, then down behind that ear, under the chin, up over the near ear to the starting-point. *1st turn:* Down behind the far ear, under the chin, up over the near ear to the starting-point, and down behind the far ear to the neck. *2nd turn:* Horizontally round the front half of the neck, obliquely up and across the back of the head to the side on a level with the tip of the far ear. *3rd turn:* Across the brow to the near ear, then obliquely down the back of the head to the neck, and horizontally round the front of the neck to the near ear. Up over the near ear to the starting-point on the top of the head. Repeat the three turns alternately until the dressing is covered. Finish with the third turn when it reaches the nape of the neck. Pin the bandage in the nape of the neck, then carry the roll up vertically across the head to the brow. Cut off the bandage, leaving a tail 8 inches long. Slip the tail under the horizontal turns on the brow by threading it under with a closed pair of blunt-pointed scissors. Bring it back vertically to the top of the head and pin with a safety-pin. This makes a firm and very secure bandage. Extra pins may be inserted on either side above the ears. If the bandage is used for the neck, neither ear need be covered in. If the bandage is needed for both ears, cover both instead of one as described. Note that no complete horizontal turn is taken round the neck; this is important in all neck bandages.

Second bandage for the neck.—Bandage, 2½ inches wide, 6 yards long. *To start:* Place the end beneath the ear on the sound side and take the bandage round the neck to the nape. *1st turn:* Bring the bandage obliquely up the back of the head, horizontally round the brow, then obliquely down to the nape of the neck. *2nd turn:* Horizontally round the front of the neck, over the tip of the shoulder, under the axilla, over the shoulder, crossing the previous turn, and round to the nape of the neck. Proceed with turn No. 1 and continue the turns alternately until the dressing is covered.

Spica of Shoulder.—Bandage, 3 inches wide, 6 yards long. *To start:* Make one figure-of-eight (Fig. 63) turn round the upper arm 4 inches below the shoulder. *1st turn:* Carry the roll up towards the shoulder on the outer side. *2nd turn:* Round the back, below the axilla, across the front of the chest on to the arm, crossing the previous turn. Repeat turn No. 1, and continue the two turns alternately until the shoulder is covered in. Finish with turn No. 2, pinning the tail on the shoulder or the chest (Fig. 69).

Breast Bandage.—1. *To support the breasts* (Fig. 70).—Bandage, 3½ inches wide, 6 yards long. Two bandages will be needed.

To start: Place the end of the bandage below the breast, take one turn round the trunk to the starting-point. *1st turn:* Take the bandage up over one breast, over the opposite shoulder, down the back obliquely and round the trunk. *2nd turn:* Obliquely up the back, down over the second breast, then round the trunk to the starting-place. Continue these turns alternately until the breasts are covered.

2. *Single breast bandage.*—Same bandage as above.

To start: Place the end of the bandage below the breast to be bandaged. *1st turn:* Round the trunk to starting-place (horizontal turn). *2nd turn:* Obliquely up across the breast, over the opposite shoulder and down to the starting-point (oblique turn). In both the horizontal and oblique turns, each turn overlaps the preceding one a third of its width, the breast being bandaged from below upwards and within outwards.

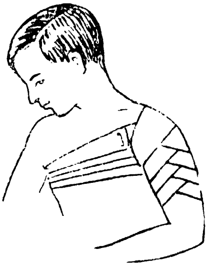


Fig. 69. Ascending spica of the shoulder.

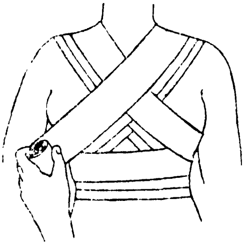


Fig. 70. Double breast bandage.

The Axilla.—Bandage, 3½ inches wide, 6 yards long.

1st turn: Ascending spica of shoulder (Fig. 69). *2nd turn:* Spiral (Fig. 61) around the upper part of the trunk. Continue the turns alternately until the dressing is covered, and pin the bandage on the chest.

Arm to the Side with the Elbow Unsupported.—Bandage, 3½ inches wide, 6 yards long. Take spiral turns (Fig. 58) around the trunk including the upper arm, starting just above the elbow. Sling the hand in a narrow sling (Fig. 86).

Arm to the Chest, Elbow Supported (Clavicle) (Fig. 71).—Two bandages, 3½ inches wide, 7 yards long.

To start: Place the end of the bandage on the chest on the sound side. *1st turn:* Carry the bandage once round the trunk in the direction of the injured arm, then back to the starting-point. *2nd turn:* Take the roll obliquely up across the chest, across the injured shoulder, down the back of the arm and up the front of the same arm, supporting the elbow to the shoulder, crossing the previous turn; then obliquely down the back to the starting-place. Continue these turns alternately until the arm is covered. The horizontal turns commence at the lowest part of the trunk and work upwards; the vertical turns commence at the outer edge of the elbow and arm and work inwards. This makes the pattern on the chest over the arm and on the shoulder. Finish with the first turn, pinning the bandage on the chest.

Spica of Hip.—1. *Ascending* (Fig. 72).—Bandage, 3½ inches wide, 7 yards long.

To start: Take a figure-of-eight (p. 131) turn round the thigh, about 4 inches below the hip. *1st turn:* Take the bandage obliquely over the front of the thigh, under the hip, across the back and obliquely down across the front of the abdomen, crossing the previous turn on the thigh, and repeat. This forms a figure-of-eight, the small loop being round the thigh, the larger loop round the trunk. The crossings should be in a line on the outer side of the thigh and hip. Finish by pinning above the hip.

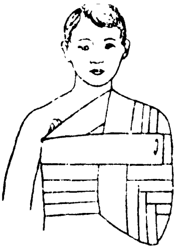


FIG. 71. Arm to the chest with the elbow supported.

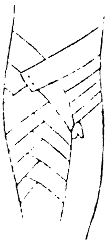


FIG. 72. Ascending spica of hip.

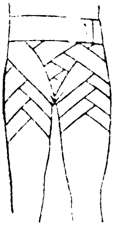


FIG. 73. Double spica of hip.

2. *Descending spica of the groin.*—Use the same bandage and apply in the same manner, but start with the large loop around the trunk first, making the second loop around the thigh last.

3. *Double spica of the hip* (Fig. 73).—Same bandage; but two will be needed.

Start as for ascending spica. *1st turn:* Take the bandage obliquely over the front of the thigh under the hip and round the trunk. *2nd turn:* Down over the front of the abdomen, the inner side of the second thigh, up over the thigh, obliquely across the abdomen, round the trunk, and obliquely down over the first thigh, crossing the first turn. Continue these turns until the area is covered. Finish by pinning on the trunk in the middle line.

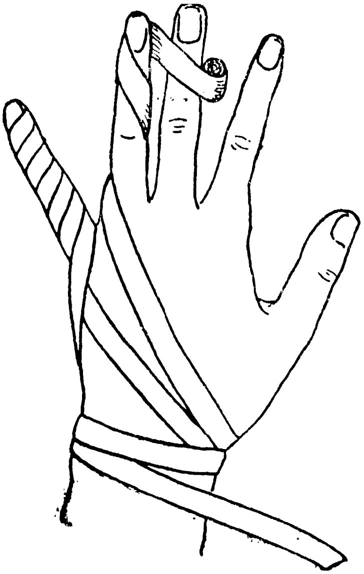


Fig. 74. Finger bandage.

An ascending spica is used for the first thigh, a descending spica on the second.

Finger (Fig. 74).—Bandage, ¾ inch wide, 2 yards long.

Recurrent (p. 132) over the tip, spiral (p. 131) or figure-of-eight to knuckle, figure-of-eight (p. 131) from knuckle over the back of the hand and around the wrist. Finish by pinning on the upper aspect of the wrist. The recurrent bandage over the tip is omitted if the end of the finger is not to be covered.

Hand.—Bandage, 2 inches wide, 7 yards long.

Recurrent (p. 132) over fingers, taking all the fingers in together. Spiral (p. 131) from tips of fingers to the knuckles; then figure-of-eight (p. 131) over the back of the hand and around the wrist. The fingers may be bandaged separately if desired, using the bandage described for fingers (see Fig. 74).

Thumb.—Bandage, 1½ inches wide (Fig. 75).

Recurrent (p. 132) over tip, spiral (p. 131) to first joint. Spica (p. 131) from first joint, over the back of the hand, around the wrist and up, taking the roll on the inner side of the thumb to cross the previous turn. Start the bandage from without inwards.

Arm.—Bandage, 2½ inches wide, 7 yards long (Fig. 76).

Figure-of-eight (p. 131) over wrist, spiral and reversed spiral (p. 131) to elbow, divergent spica (p. 131) over flexed elbow; reversed spiral for upper arm. Figure-of-eight may be applied up the whole arm if preferred. If the elbow is to be kept straight, a figure-of-eight is applied instead of the divergent spica.

Elbow Flexed (Fig. 67).—Divergent spica as described on p. 131.

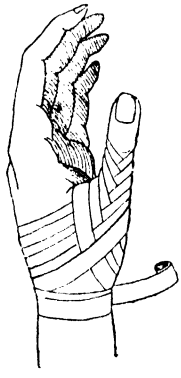


Fig. 75. Spica of the thumb.

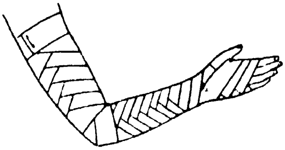


FIG. 76. Spiral, reversed spiral, and figure-of-eight bandage of the arm.

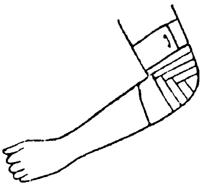


FIG. 77. Divergent spica of the elbow.

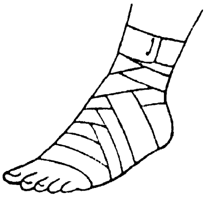


FIG. 78. Spiral and figure-of-eight bandage applied to the foot.

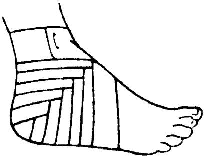


FIG. 79. Divergent spica of the heel.

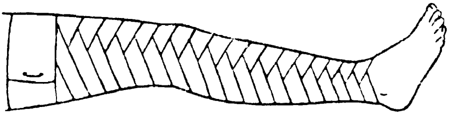


FIG. 80. Figure-of-eight bandage applied to the leg.

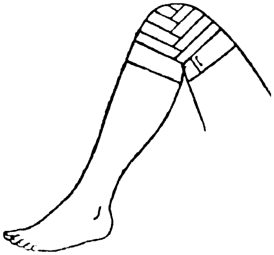


FIG. 81. Divergent spica applied to a flexed knee.

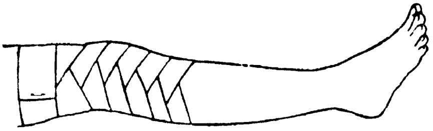


FIG. 82. Figure-of-eight bandage applied to a straight knee.

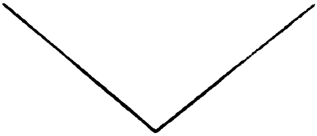


FIG. 83. Large triangular bandage (handkerchief). A, the base. B, the point. C and D, the ends.

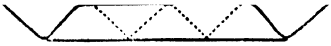


FIG. 84. Narrow triangular bandage (cravat). The dotted lines denote the folded edge of the triangular bandage.

Toes.—As for fingers.

Foot (Fig. 78).—Bandage, 2 inches wide, 7 yards long.

Recurrent (p. 132) over toes; spiral and reversed spiral (p. 131) over foot; divergent spica (p. 131) if heel is to be covered in, otherwise figure-of-eight (p. 131) round ankle.

Heel (Fig. 79).—Divergent spica (p. 131).

Leg.—Bandage, 3 inches wide, 7 yards long.

Spiral and reversed spiral (p. 131) to knee; figure-of-eight (p. 131) over knee; reversed spiral over thigh, ascending spica (p. 135) for hip. Figure-of-eight may be used entirely if desired (Fig. 80).

Flexed Knee (Fig. 81).—Divergent spica as described on p. 131.

N.B.—A divergent spica must not be applied to the knee unless it is to be kept flexed.

Straight Knee (Fig. 80).—Figure-of-eight pattern is used (p. 131).

Triangular Bandages.—*To make.*—Use either muslin or unbleached calico. Cut or fold 1 yard square across diagonally.

Description.—The long side of the bandage is called the *base*, the opposite end the *point*, the two other points the *ends* (Fig. 83). The bandage may be used in its full size (handkerchief), or as a broad or narrow bandage (cravat) (Fig. 84). The broad bandage is made by folding the *point* down to the *base* and then folding the bandage in two; used round the chest for injuries to shoulder and collar bone. The narrow bandage is made by folding the *point* to the *base* and then folding the bandage in three; used to tie splints in place or when a narrow bandage is required for covering a dressing. When the bandage is used open (handkerchief), it is made to fit the patient by turning up a hem at the base. The bandage is fastened by tying the *ends* with a reef knot or safety-pins. Knots must be tied as far away as possible from the part on which the patient will lie (p. 529).

Head.—Fold a hem about 1½ inches wide; stand behind the patient; place a bandage on the head with the centre of the *base*, with the hem outside, on the middle of the forehead, the *point* hanging over the back of the neck. Carry the two *ends* round the head to the nape of the neck, cross but do not tie them over the *point*; bring them back to the forehead and tie in the centre immediately above the nose. Draw the *point* down as far as possible, then turn it up and pin on top of the head. In carrying the *ends* round the head they must not cover the ears but rest above them (Fig. 85). For the forehead, cheek, ear, or eye use a narrow cravat, taking it straight over the part to be bandaged and tying it on the opposite side (Fig. 86).

Shoulder.—Two bandages are required. Spread one bandage out and turn up a hem according to the required size. Place the centre of the bandage on the shoulder, the *point* running up the side of the neck, the hem resting on the upper third of the arm; carry the two *ends* round the arm and tie on the outside. Fold the second bandage as a broad bandage and apply as a narrow sling. Place one *end* over and beyond the point of the first bandage, sling the arm, carrying the other *end* over the opposite shoulder and tying it. Pull the *point* of the first bandage up as far as it will come; turn it down and pin it (Fig. 87).

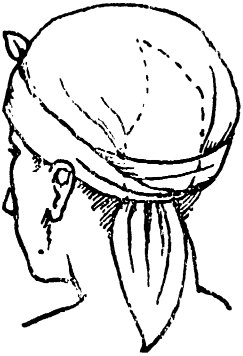


FIG. 85. Triangular bandage applied to the head.

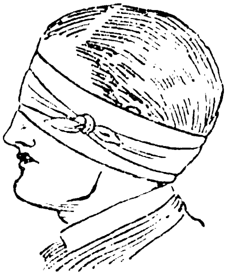


FIG. 86. Triangular bandage applied to the eye.

Hip.—Tie a narrow bandage around the patient's body above the hips, tying it on the injured side. Place the centre of a handkerchief bandage over the wound; carry the *ends* round the thigh and tie them. Take the *point* under the bandage round the waist; turn it down over the knot and pin it (Fig. 88) in position.

Hand or Foot.—Spread the bandage out after making a hem; place the ankle or wrist on the *base* with the toes or fingers towards the *point* (the hand palm downwards). Turn the *point* over the foot or hand, carry the two *ends* round the ankle or wrist, cross them and tie in front (Figs. 89 and 90).

Large Arm-sling.—Stand in front of the patient; spread out a bandage, place one *end* across the sound shoulder and cross the forearm over the centre of the bandage so that the *point* is behind the elbow. Carry the second *end* over the shoulder of the injured side and tie it at the side of the neck to the opposite *end*; bring the *point* round to the front of the elbow; fold the bandage in neatly and pin it. The forearm should be slightly raised and the hand covered (Fig. 91).

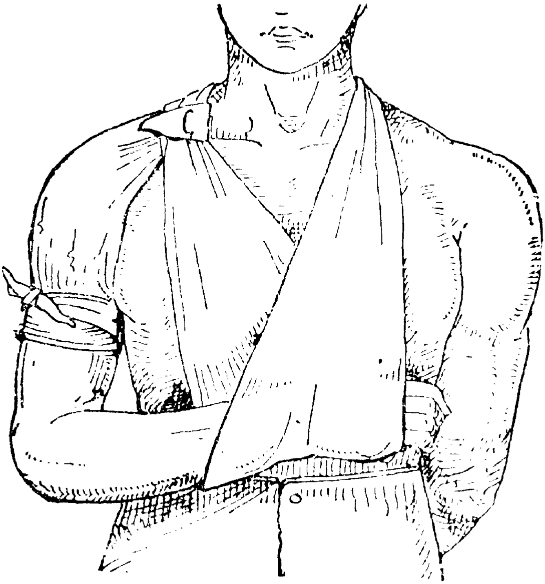


FIG. 87. Triangular bandage applied to the shoulder with narrow arm-sling.

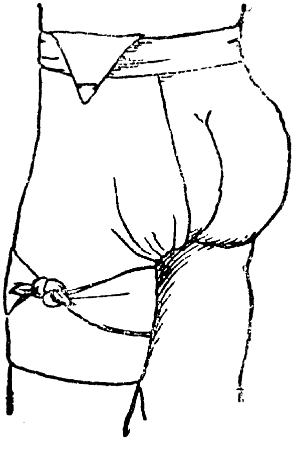


FIG. 88. Triangular bandage applied to the hip.

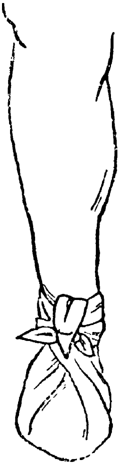


FIG. 89. Triangular bandage of the foot.

Figs.* 87 *and* 88 *from 'First Aid to the Injured' by Drinkwater.

To apply a Sling when the Shoulder is Injured.—Place one *end* under the axilla on the injured side, with the *point* immediately behind the elbow; bring the other *end* over the sound shoulder and tie on the sound shoulder to the opposite *end*. Draw the *point* firmly over the elbow and pin (Fig. 92).

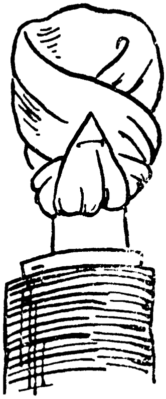


Fig. 90. Triangular bandage of the hand.

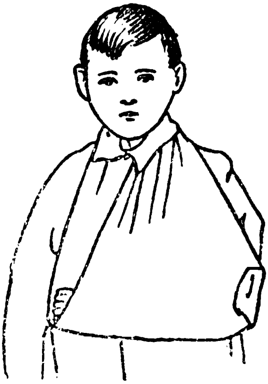


Fig. 91. Large arm-sling applied.

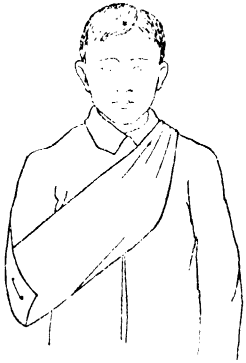


Fig. 92. Method of applying a sling when the shoulder is injured.

Chest.—Place the centre of a bandage on the injured side; carry the two *ends* round the waist and tie them; carry the *point* over the shoulder of the injured side and tie to one of the *ends*. The back is bandaged in the same way, beginning by placing the centre of the bandage on the back (Plate IVa, b).

Thomas's Collar and Cuff Sling (Plate XXIV).—A sufficient length of lamp wick (or webbing) is needed, one end of which encircles and is knotted in front of the neck; the other end is tied around the wrist. The two free ends are then knotted together, bringing the wrist in the cuff to within a few inches of the collar. The elbow remains entirely free and unsupported, and acts as extension. The parts surrounding the neck and wrist are padded with folded flannel, or chamois leather. An emergency sling could be made of calico bandage, but is neither so comfortable nor so efficient.

SPECIAL BANDAGES

Tailed Bandages.—Four-tailed Bandage for Jaw—*Material.*—Unbleached calico, 1 yard long and 4 inches wide. Cut a slit 1½ inches long in the centre of the bandage. Tear down the centre of each end to within 2 inches of the slit. The slit is then placed over the point of the chin. The lower tails are carried up from under the chin in front of the ears and tied on the crown with a single knot; the uppermost tails are then carried to the back of the neck and tied in a single knot; the bandage is then secured by tying each upper tail to the opposite lower one in a bow knot. The knots must be tied above the part of the head on which the patient will lie. It is most important that the upper tails supporting the jaw are first fixed firmly, the lower tails are then fixed less tightly. Never to be used for a fracture of the jaw.

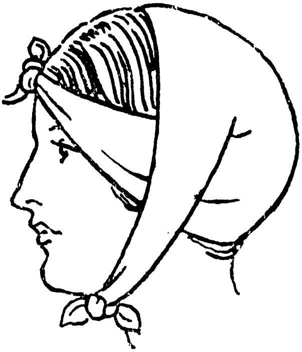


FIG. 93. Four-tailed bandage applied to the back of the head.

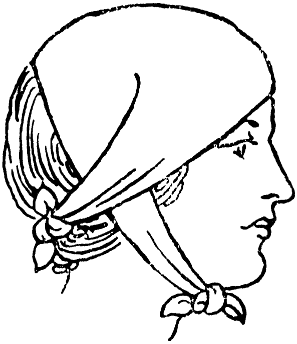


FIG. 94. Four-tailed bandage applied to the front of the head.

Roller Bandage and Barrel Bandage for Fracture of the Jaw, see Plate V.

Four-tailed Bandage for the Head (Figs. 93 and 94).—*Material.*—Unbleached calico, 1 yard long and 8 inches wide.

Tear up each end to within 6 inches of the centre of the bandage; place the centre of the bandage over the back of the head; tie the upper tails under the chin in a reef knot; bring the lower tails up over the ears and tie on top of the forehead. For the front of the head, place the centre of the bandage on top of the head; tie the tails from the forehead below the occiput, those from the head under the chin.

Abdominal Many-tailed Bandage (Fig. 95).—*Materials.*—Unbleached calico, domette, flannelette, flannel.

Cut strips of material 1½ yards long, 4 inches wide, and six to eight in number according to the size required. Place five strips horizontally, each strip overlapping one-third of the preceding strip. Keep in position by one row of stitching down the centre. Take another strip, place one end of it on the lower border of the bandage covering the stitching, carry it up vertically over the stitching to the top and down under the bandage to the lower border; stitch it in position by sewing it all round. The vertical piece of bandage left over is then slit up the centre and forms the perineal straps. If desired these may be omitted. Cut strips of white cardboard 2 inches wide and 3 inches longer than the width of the bandage (strips of clean thick paper will do). Roll the tails on either side of the bandage over the cardboard, and roll the cardboard towards the centre of the bandage. Mark the length of the tails on the projecting piece of cardboard so that the size of the bandage may be seen without unrolling it. Pin the strips together in the centre with a small pin.

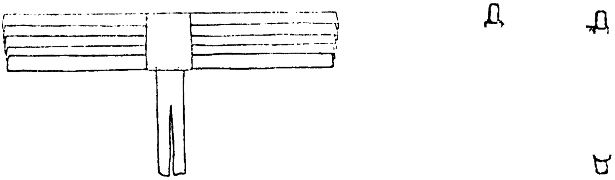


FIG. 95. Many-tailed abdominal bandage. The smaller diagram shows a many-tailed bandage rolled up.

To apply.—Remove the pin and unroll sufficient bandage on either side to place under the patient's back. Place the bandage in position under the back, keeping the tails rolled over the cardboard. The centre of the bandage must be under the spine. Let the patient lie down, and pull the bandage firmly by both rolled ends to ensure it being flat. Unroll the tails on either side. Apply by folding the strips across the abdomen from below upwards, using the strips alternately from either side and folding in the ends neatly. The crossings should form a pattern down the centre of the abdomen. Pin on either side, at the top and bottom. Bring the perineal straps up between the thighs and pin to the lower border of the bandage in front. These straps may be unfastened when necessary for washing, etc. This bandage may be applied from above downwards. Care must be taken when introducing the bandage under the back to see that it is the right way up.

Many-tailed Bandage for the Breast.—The bandage is made as above, omitting the perineal straps. Two pieces of bandage

3 inches wide are stitched to the double centre portion of the bandage at the back. The bandage is applied from below upwards. The strips are then brought over the shoulders and pinned to the upper border of the bandage in front. A many-tailed bandage may also be used for a limb. It is made and applied in the same way, but is cut much narrower and longer.

T-Bandage (Fig. 99).—*Materials.*—Unbleached calico, flannelette, or domette.

Cut two strips of material 1 yard long and 4 inches wide. Fold one piece in two, which will form a band 2 inches wide. Stitch one end of the second strip to the centre of the narrow one; this forms a T. Slit the wide strip down the centre for half its length.

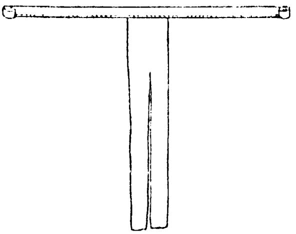


FIG. 96. T-bandage.

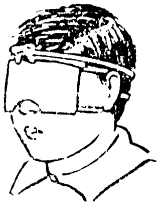


FIG. 97. 'Moorfields'' eye bandage.

To apply.—Tie the narrow strip round the waist, tying the ends in front. Bring the two tails up between the thighs, and fasten to the belt on either side of the abdomen. A single slip bow should be used when fastening the tails so that they may be easily undone.

Binders.—*Materials.*—Calico, flannel, flannelette, domette, roller towelling.

Binders may be used for the chest, abdomen, spine, or limbs. For the trunk use the material double and of sufficient length to encircle the trunk one and a half times.

To apply.—Place the binder under the patient and bring it over the part to be bandaged. Fold it over neatly and pin it firmly, using safety-pins. (For the application of an obstetrical binder see p. 706).

'Moorfields'' Eye Bandage (Fig. 97).—Take a double strip of fine linen 6 inches long by 3 inches wide. Cut out an oval-shaped piece to fit over the lower end of the nose. Attach a piece of narrow tape 3 inches long to each of the four corners and sew the bandage round. Sew the two loose ends of tape to another piece of tape ½ yard long on either side.

To apply.—Place the bandage smoothly over the eyepads, and pass the loops over each ear; then carry the long pieces of tape round the head, crossing them at the back, and tie in front in the middle of the brow over a small roll of cotton wool. Used when both eyes need to be covered, and it is desirable to move the patient's head as little as possible for dressing the eyes.

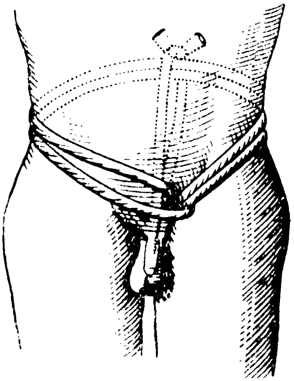


Fig. 98. Wool truss applied.

From 'A Manual of Surgery' by Rose and Carless.

Wool Truss (Fig. 98).—*To apply a wool truss.*—For infants suffering from single hernia this mode of support is often sufficient. Its advantages are, that it is comfortable, inexpensive, and may be washed or renewed as frequently as necessary. The mother can be taught how to apply it.

To apply.—A skein of 'natural' wool or grey 'fingering' is required. One end of the skein is divided and each separated end is tied with a small piece of wool. The loop (or uncut end of the wool) is placed over the site of the hernia and carried upwards across the opposite side of the abdomen, round the back, and obliquely down the front to meet the loop. The divided ends are then passed through the loop and carried downwards over the perinaeum, and tied to the transversed portion behind. The truss is changed night and morning or as often as necessary. When changing the truss, care must be taken to support the hernia. In cases of double hernia in infants, a rubber belt fitted with two pneumatic air-pads may be used. It is more comfortable than the ordinary truss and it is easy to cleanse and does not chafe the skin.

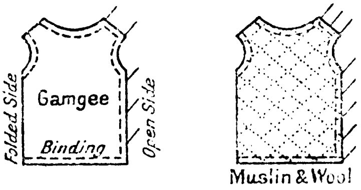


Fig. 99. Pneumonia jacket.

Pneumonia, or Cotton Wool, Jacket is used in pneumonia and other acute chest conditions, it is also valuable for patients undergoing severe operations likely to cause shock and loss of body heat, weakly children and any condition requiring constant body heat and protection from chill (Fig. 99).

Method.—The jacket may either be made of gamgee tissue or of muslin lined with absorbent wool. Fold a piece of gamgee in half to make the required size, a vest may be used as pattern, cut out an armhole in the folded side and one in the open side, the neck being cut out at the top. Bind the edges with bandage sewn on, then sew on tapes down the open side and open shoulder. The procedure is the same if muslin is used, but after cutting out the muslin, line it with absorbent cotton wool which is tacked on to the muslin (quilted).

Perineal Slip.—A convenient and useful slip for a female patient when the legs are to be examined or operated upon is made as follows: Calico is cut to pattern, see Fig. 100, hemmed all round, and tapes of sufficient length stitched to each corner. The tapes are tied around each leg at the hips, the slip covering the genitals.

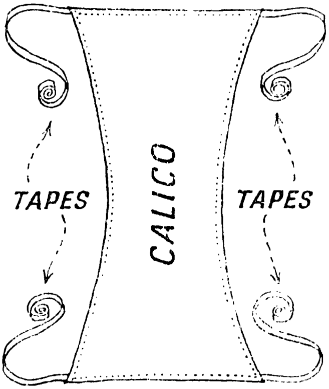


Fig. 100. Perineal slip.

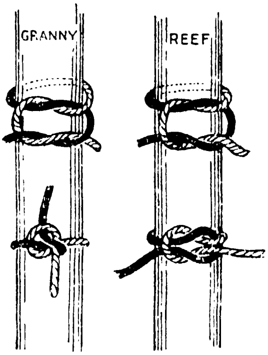


Fig. 101. Granny and reef knots. The upper knots have been loosely tied; below, the same knot is seen, having been tightened.

Knots (Fig. 101).—1. **Granny Knot.**—This is the term applied to the common knot. It is made by tying both halves of the knot in the same direction. Its disadvantages are, that it readily slips or comes undone, and that it is untidy. Its advantage is, that it may be undone quickly if necessary.

2. **Reef Knot** (Fig. 101).—Tie the first half of the knot as usual; then tie the second half in the reverse direction. The advantages of this knot are that it will not slip or come undone, and that it is neat in appearance. It is more difficult to untie than a granny knot.

3. **Surgeon's Knot.**—This knot is used when a knot of exceptional durability is needed.

To tie.—The first half of the knot is tied as usual. The ends are then twisted once, the right to the left and the left to the right. The first part of the knot is then drawn tight, the second part being tied as a reef knot.

4. **Clove Hitch.**—This is a form of slip knot commonly used for

tying down a patient's hands, sling, etc. When applied, the knot cannot become tighter however much traction is made on it.

(*a*) *To make the clove hitch.*—Hold the bandage between the fingers and thumb of either hand with the palms uppermost. The hands should be held about 8 inches apart. Hold the bandage firmly and turn the hands palm downwards, and in doing so throw the right-hand tail inwards over the bar of bandage. Turn the right-hand palm upwards with the loop around the fingers and slip the lower part of the loop from the left hand on to the right hand without altering its position. The two loops are then on the right-hand and the clove hitch is made.

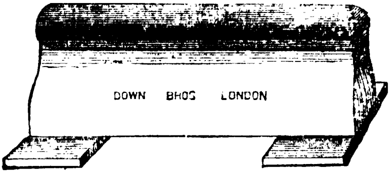


FIG. 102. Pelvic rest.—Useful when applying bandages to the pelvis. The rest is placed crosswise beneath the patient's sacrum.

(*b*) *Another method.*—Make a loop with the bandage by twisting the bandage in the right hand over that in the left hand. Hold in position with the thumb and finger of the left hand. Make a second loop in the same way and place it on top of the first. Hold with the left thumb and finger. With the right hand place the upper loop beneath the lower and the clove hitch is made.

THE APPLICATION OF EXTENSION (TRACTION)

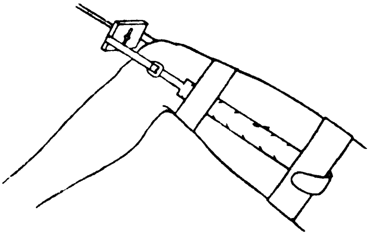


FIG. 103. Method of applying strapping for extension of the hip joint with the knee flexed.

Extension is the term applied to continuous traction maintained on a limb or part. Extension may be employed to reduce spasm in contracted muscles and so prevent or improve deformities, as in some spinal diseases (p. 618); to keep the inflamed surfaces of a joint apart and at rest, as in hip disease (p. 615); to prevent spasm of muscles which may result in displacement or shortening in fractures (p. 530). Extension is commonly effected by traction with either of one of the following:

(*a*) With weight and pulley.

(*b*) Suspension, either with or without weight and pulley: (1 Vertical; (2) Horizontal.

(*c*) Extension splints, or plaster cast, with or without traction.

A. **Extension by Weight and Pulley.**—The weight may be attached to the limb by one of the following means:

(1) Strapping and stirrup.
(2) Skeletal traction.
(3) Zinc gelatin paste (Böhler's paste), Sinclair's glue.

1. **Extension by Strapping, Weight, and Pulley.**—*Requisites.*—Fracture boards; blocks; weights; cord; razor, shaving brush, hot water, and soap; scissors; strapping; stirrup with webbing and buckles attached; roller bandages; safety-pins; strapping heater, either an enamel jug filled with boiling water or a spirit lamp.

Preparation.—Place the fracture boards under the mattress to render the bed firm (see p. 23). Shave the limb (p. 438), except in the case of children, when it is not necessary.

To cut the strapping.—Cut a piece of strapping 9 inches wide and about 2½ yards long (more or less, according to the length of the leg). The portion marked 9 inches in diagram is folded over a wooden square 3 inches, leaving 8 inches of folded strapping and wood to form the stirrup. From the remainder of the strapping which will form the side leg pieces on either side of the leg, cut 3 inches of strapping (marked in diagram by a dotted line); this leaves the side pieces 3 inches wide and all sticky surface. The edges of these side pieces are nicked to enable the strapping to fit the leg without creasing.

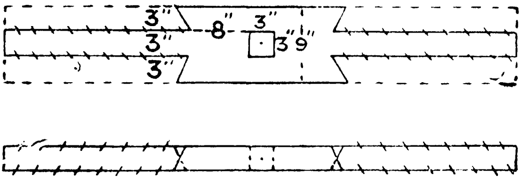


FIG. 104. Stirrup.

Method of application.—1. Side pieces should reach to middle of thigh, or (in fractures of the upper end of femur) to top.

2. Wooden stirrup should be placed close against the sole of the foot, not several inches from it. Traction may be applied by attaching cord and weight to each side piece, instead of using a stirrup. Two pulleys and wights are then needed.

Heat the strapping and apply the side pieces to either side of the leg, the cross-pieces 3–4 inches wide to be applied in the following order:

(*a*) Surrounding thigh just above patella and femoral condyles.
(*b*) Surrounding leg just above tibial tubercle.
(*c*) Surrounding thigh 2 inches from the top of the side pieces (the top of side pieces to be turned down over this ring and secured

with another ring of strapping). This prevents any tendency to slipping if much weight is attached.

(*d*) Five inches above the ankle to keep the side pieces closely applied to the leg. Bandage the limb firmly from ankle to thigh.

The length of the stirrup should be equal to the width of the lower half of the foot and about 3 inches in width. The limb having been placed in the required position, the free end of the cord is drawn over the pulley, fixed to the foot of the bed, and the weight is attached with an S-hook (Fig. 105). It is advisable to allow an hour or two to elapse before attaching the weight in order to give the strapping time to become firmly adherent. If necessary, sand bags are used to keep the limb in position. When extension is applied to the knee, the strapping should reach from the ankle to below the knee; to the shoulder, from above the elbow to below the shoulder. When applying extension it is important to see that the pulley is adjusted in a line with the long axis of the limb, so that traction is made exactly in this line. The amount of weight varies with the age of the patient and the condition for which the extension is applied, a general guide being ¾ lb. for each year of age in children. Cans filled with shot may be used. or ordinary weights; failing these, a brick or a toy pail filled with stones; but the last two contrivances must be brought to the prescribed weight before being attached.

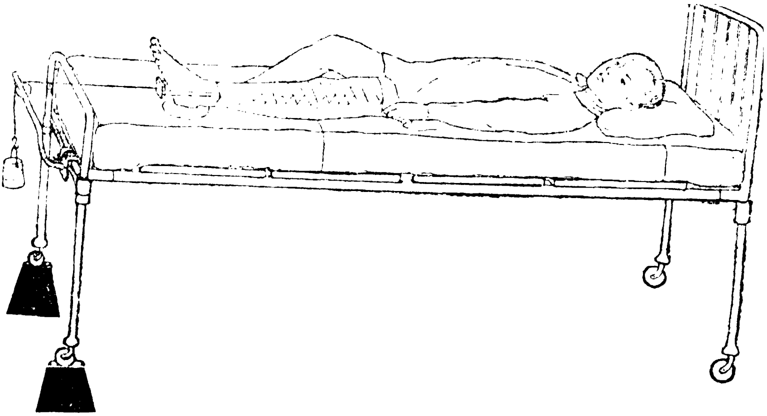


FIG. 105. Extension applied to the hip, with counter-extension.

The foot of the bed is raised on 6- or 8-inch blocks (see counter-extension). The patient must remain in the dorsal position, with a pillow which does not raise his shoulders off the bed. Children should be prevented from turning over or sitting up by means of shoulder straps (Fig. 106). Shoulder straps consist of a piece of strong webbing or leather about 2 inches wide and of sufficient length to reach across the chest from arm to arm. Stitched to the ends of this piece of webbing are two loops or armholes, made of the same material. The child's arms are put into the armholes and a strap or piece of webbing of sufficient length to reach across the bed is threaded through the armholes at the back and tied down firmly on either side of the bedstead. Fractures and acute cases treated with extension by weight and pulley must on no account have the weight lifted. In recent fractures, displacement might occur from raising the weight, and in acute cases intense pain may result. (For bedmaking of extension cases see Chapter XVI, p. 532.)

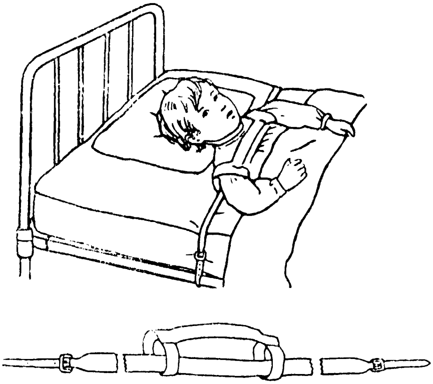


FIG. 106. Shoulder straps and back strap applied. The small diagram shows the braces when not in use.

2. **Skeletal Traction.**—The use of skeletal traction is modern: its use depends on a strict observance of aseptic principles. In this method a wire or pin is passed through the bone, or a caliper into either side of the bone—e.g. femoral condyles, tibia, or os calcis, and the traction force applied directly to it. One of the following are most commonly used: Kirschner's wire and stirrup (Fig. 107), Steinman's pin, Pearson's traction calipers, or an ice tong caliper. The advantages of this method are:

(1) Direct traction is obtained in the fractured bone rather than through the soft parts.

(2) Powerful traction can be used—such as would be impossible with skin extension.

(3) When using skeletal traction it is possible to exercise joints in the fractured limb which would otherwise be immobilized and this is of great importance in preventing stiff joints.

Method.—The skin is prepared (p. 437) and the patient prepared for general anaesthesia (p. 446). The sterile transfixion pin, or caliper, is then bored into the bone by a drill, and a sterile spirit dressing is placed over the points of insertion. *Traction:* Traction is applied by fixation of the ends of the pin to a specially devised stirrup to which the cord is attached which passes over pulleys and the weight is attached as in strapping extension (p. 150). The calipers require no stirrup, the cord being attached to the ring of the caliper.

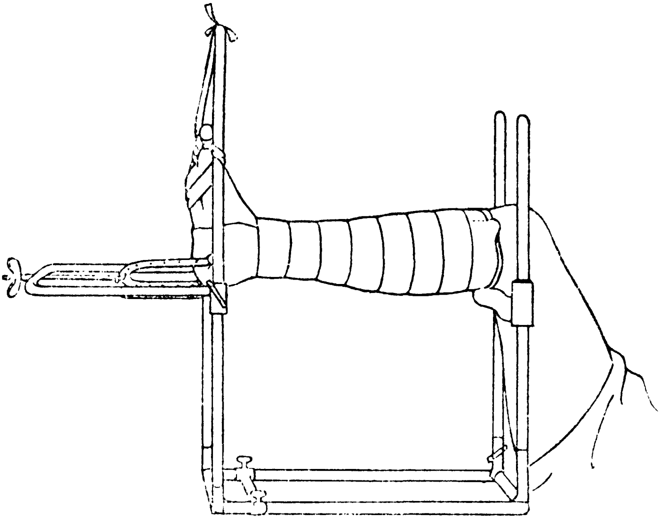


FIG. 107. Traction with a Kirschner stirrup.

3. **Böhler's Paste** (zinc-gelatin paste).—The paste is composed of zinc oxide 1 kg., glycerine 1 kg., sheet gelatin 1 kg., dissolved in 1,000 c.c. of water in a water bath.

Method.—Stockinette of a size that will fit the limb closely and 2 inches longer than twice the length of the part to be covered is rolled into a double-headed roller (Fig. 56). Two triangular pieces of linen are then sewn on to the double external end between the rolls. The part of the limb to be covered is painted with the paste, taking care it is not too hot. The paste is applied with a brush brushing upwards towards the body. The inner layer of stockinette is then unrolled over the paste, avoiding wrinkles, and its outer surface painted with the paste. The outer layer is then unrolled to adhere to it. A bandage is applied, leaving the knee uncovered by bandage as sores are more liable to occur at the sides and front of the knee. To prevent swelling, the foot and leg below the level of the extension should be firmly bandaged.

Sinclair's glue is another preparation applied in the same way for the same purpose, but now superseded by Böhler's paste.

Counter-extension.—The most usual way of securing counter-extension is to place 6- to 8-inch blocks under the foot of the bedstead, the patient maintaining the recumbent position; the body then makes the counter-extension (see Fig. 105). If a Liston splint is used, counter-extension may be made with a perineal band.

Counter-extension to Spine (Fig. 108).—*Requisites.*—A halter or bridle, with stirrup, cord, pulley, and weights. The halter is made as follows: Cut a double piece of calico 2 inches wide and of sufficient length to reach from the patient's chin to 2 inches beyond the top of the head. Cut a second band the same width and of sufficient length to go round the head and across the brow. Fasten it with buttons and button-holes to the first strap at the spot which corresponds to the upper border of either ear.

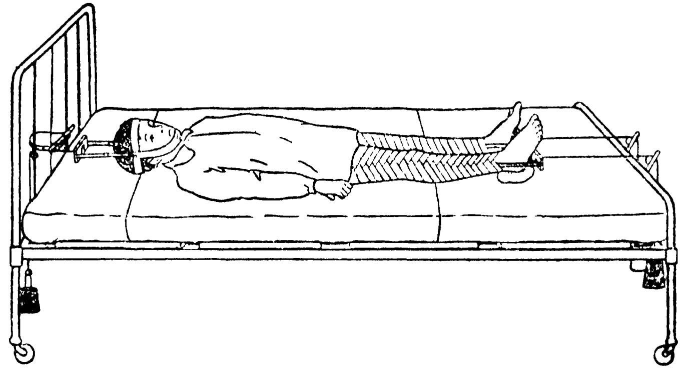


FIG. 108. Extension with counter-extension applied to the spine.

The 'bridle' is made of webbing, one piece passing over the forehead, and the other under the occiput, the two being mitred together on each side, above the ear, where the stirrup webbing joins them.

To apply.—The patient has extension applied to both legs (for method see p. 150). The halter is then applied and a slit is made in the vertical band in which the patient's chin is placed, the straps being carried up on either side of his head. The circular strip is then taken under the back of his head and fastened to the buttons on either side of the vertical strap. The free ends of the vertical strap are threaded through the buckles attached to the stirrup. The cord is fixed and threaded through the pulley attached to the centre of the head of the bedstead. The required weight is then applied. One thin pillow is allowed under the head in most cases.

B. Suspension may be employed in two ways: by Bryant's *vertical* extension and by *horizontal traction* suspension.

Vertical Extension (Bryant's) (Plate VIII).—This form of extension is frequently used in cases of fracture of the femur (p. 539) in children under 8 years of age. A general anaesthetic is usually administered before applying the extension (for preparation for anaesthesia see p. 446). The strapping and stirrup are applied as described on p. 150, both legs being treated in the same way. A wooden frame or Balkan frame is fixed to the bed or cot, consisting of a strong bar of wood the length of the cot to form a horizontal bar, to which a vertical wooden bar is attached at either end and secured to the cot. The vertical bars must be fixed at such a height that the horizontal bar will be at least half a yard higher than the child's feet when the legs are vertical. A pulley is fixed about the middle of the horizontal bar. The child is placed in position, its hips being immediately below the pulley. Four narrow strips of Gooch splinting are strapped around the thigh, encircling the fracture. The leg is then raised vertically, the stirrup cord is passed over the pulley and the required weight is attached. The sound leg is raised vertically and tied to the horizontal bar. The legs must be raised until the buttocks clear the bed. The child hangs by its legs, its body making the counter-extension. Shoulder straps (see Fig. 106) should be applied to keep the child in position and to prevent sitting up. Cotton-wool jackets are worn over the feet and legs. They may be made of muslin or flannelette lined with wool, opened down the front of the limb and fastened with tapes. A slit should be cut at either side to enable the extension straps to pass through. Flannel pyjamas must be worn, and should fasten down either side with tapes, and be long enough to reach to the waist, back and front. The lower end of the cot is covered with a quilt, the upper portion with sheet, blanket, and quilt; the upper bedclothes being brought down to overlap the lower quilt. The child's legs protrude through the division in the bedclothes. Children are very easily attended to in this position, and are generally very comfortable and happy after the first 24 hours. The weight must not be raised for bedmaking, etc. (see p. 532).

Horizontal Traction Suspension proves successful in tuberculosis of the hip, fractures of the femur in children, flexion deformities of the knee. In its simplest form, the mattress resting on a fracture board is raised at the foot end level with the rail of the bedstead and kept in place by an iron support standing on the fracture board on the wire mattress. Strapping extension (p. 150) is applied to the thigh, or leg, and the cord from the stirrup tied firmly to the bed rail, the weight of the patient's body thus causes the extension to the fixed limb. A wooden bar is fixed between the mattress and fracture board thus causing slight flexion of the knee.

Specially devised frames on carriages are used for children requiring prolonged treatment by horizontal suspension, the child may then be moved about in or out of doors (see Plate XXXIV).

SPLINTS

Splints are applied to keep a limb in a required position, either to prevent deformity occurring, to correct deformity, or to give rest to the part. They may be made in a variety of shapes and sizes and of any of the following materials: wood, hinged wood (Gooch splinting), iron, tin, aluminium, sheet zinc or perforated zinc. Splints moulded to the shape of the part may be made in plaster of paris (p. 162), poroplastic, pexuloid, celluloid, or leather.

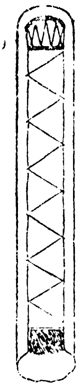


FIG. 109. Padded splint showing one end completed, the other ready to be drawn up.

Unmoulded splints should be evenly padded before being applied. This may be accomplished either by making a pad and stitching it in position (Fig. 109), or by providing several small pads of different shapes and sizes which are adjusted by the surgeon when he applies the splints.

Method of Padding a Splint (Fig. 109).—*Requisites.*—Muslin, calico, or old linen; tow; non-absorbent wool; splint thread, needle, cotton, and scissors.

Method.—Cut the muslin exactly three times the width of the splint and 6 inches longer than the splint. Lay a layer of wool over the muslin and over this lightly place well-teased-out tow until the desired thickness is attained. Fold the sides of the muslin over to the middle so that they overlap about 1 inch. Stitch them together, taking the stitches through the muslin and wool only. Leave the ends free. Place the pad on the splint with the seam against the splint. Turn the splint with the wood uppermost and stitch the pad in position. Thread the needle with a long piece of splint thread. Start 3 inches from the end of the splint. Take a stitch through the pad and bring it across the splint to the opposite side about 1 inch lower down; twist the thread after drawing it through the pad and proceed in the same way until within 3 inches of the end.

To finish the end.—Trim off all unnecessary tow and wool, and run a thread around the muslin, drawing it up to fit the splint.

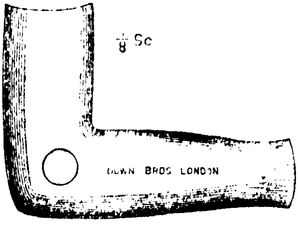


FIG. 110. Lateral angular splint.

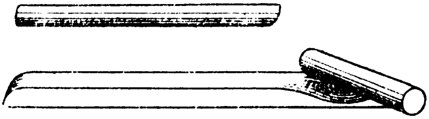


FIG. 111. Carr's splint for Colles's fracture of left hand.

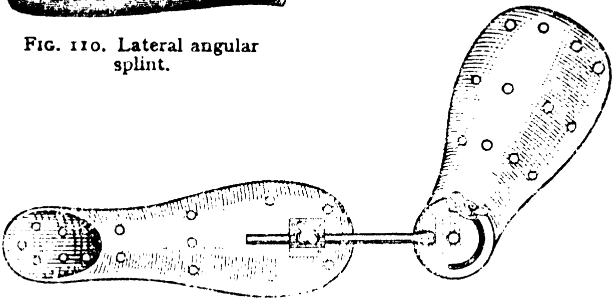


FIG. 112. Mason's splint.

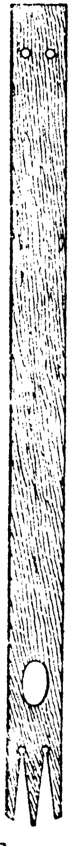


FIG. 115. Liston's long splint.

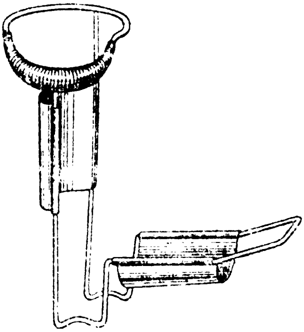


FIG. 113. Jones's humerus extension splint, for fractures of middle and lower middle of the shaft, for use with patient sitting up in bed or walking about.

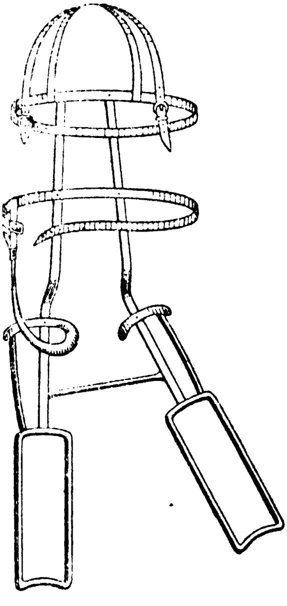


FIG. 114. Jones's abduction splint, for fractures through the hip joint and just below the trochanter.

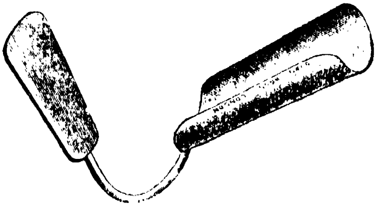


FIG. 116. Malleable splint for treatment of congenital talipes equino-varus.

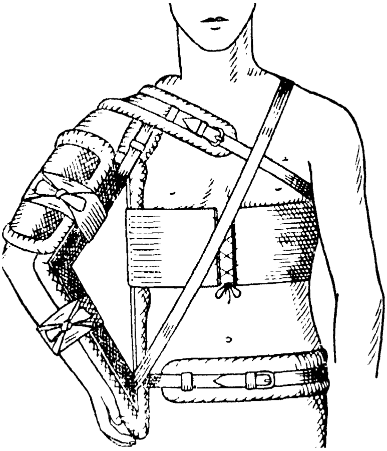


FIG. 117. Middledorf's triangle for fractured humerus. For the sake of clearness, the bandages, etc., have been represented as much smaller than would be the case in the living subject.

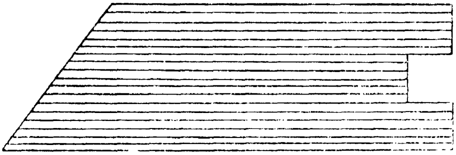


FIG. 118.

Gooch splinting for excision of the knee.

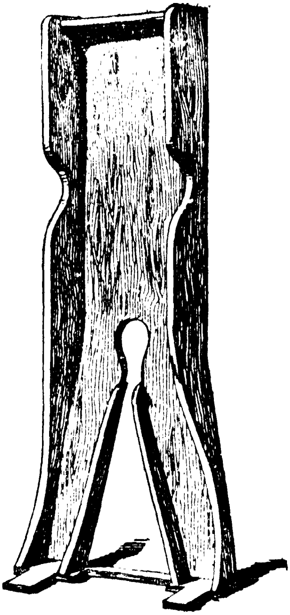


FIG. 119. Phelps's box without the mattress.

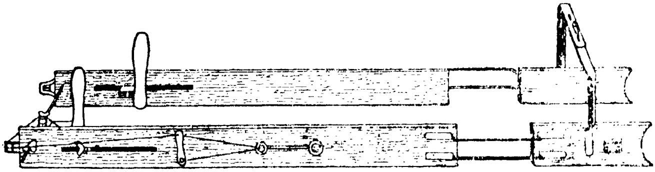


FIG. 120. Bryant's splint.

Take several horizontal stitches across the splint, 3 inches from the end, which will form a crossbar. Stitch (using the splint stitch) from the crossbar to the gathered muslin until it is fastened down. The crossbar is then button-holed to keep the stitches in position.

Splints are retained in position either by means of adhesive plaster, webbing straps and buckles, splint sheets (scotch sheets), or splint bands.

EXTENSION SPLINTS

Hodgen's Splint (Fig. 121).—This consists of an iron frame, together with a set of pulleys and cords with rings attached to hook on to the frame. An upright pulley is also needed.

Requisites.—Splint; house flannel; safety-pins; needle and thread; clips; strapping, etc., for extension (p. 150); weights; blocks.

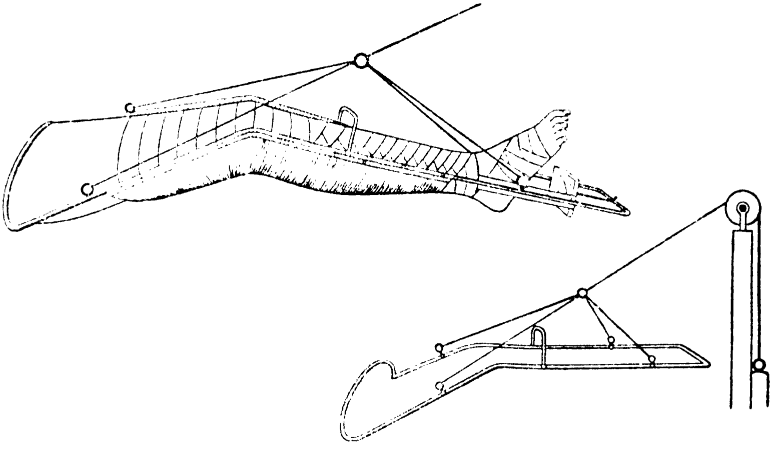


FIG. 121. Hodgen's splint and its method of application.

To apply.—The strapping for extension is applied (p. 150). Strips of house flannel 4 inches wide and 3 inches longer than the width of the frame are sewn or clipped down the one side of the frame. The strips should overlap each other for about 1 inch. The frame is then placed in position with the strips beneath the limb. The stirrup cord is fastened as tightly as possible to the bar at the foot of the frame; it must be 'taut as a harp string.' The upper part of the frame should be level with the anterior superior spine, but not touching. The strips of flannel are now clipped or sewn to the other side of the frame, so that the limb is supported in a sling. The cords and pulleys are then attached and adjusted, and the weight is applied. When finished, the limb should not touch the bed and the frame should not touch the leg. The foot of the bed is raised on blocks. The bed is made in two halves, the swinging leg protruding through the opening in the bedclothes. (See Plate IX.)

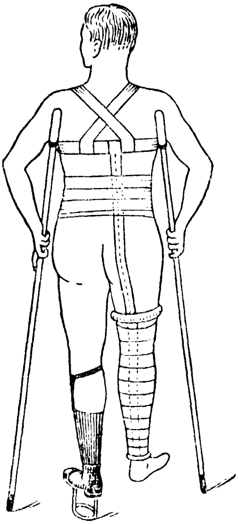


FIG. 122. Thomas's hip splint applied.

Thomas's Hip Splint (Fig. 122).—This splint is used when it is necessary to keep the hip at rest and advisable to allow the patient to get about.

To apply.—The splint is placed in position. Strips of adhesive plaster are applied around the limb, one above the ankle, the other above the knee. The limb is then covered with a flannel bandage reaching from the ankle to the middle of the thigh. The straps are crossed over the shoulders and fastened in front after securing the band around the patient's chest, and an abdominal binder (p. 146) is applied. If the splint is only worn during the day, the plaster is omitted. A patten is worn on the sound foot, and the patient walks on crutches. This splint prevents the patient from sitting.

Thomas's Knee Splint (Fig. 123).—Used in cases in which it is necessary to keep the knee joint at rest and it is advisable to let the patient get about; it may also be used when the patient is in bed for the treatment of fractures. The leg is placed in the splint, the band encircling the leg below the hip, the thigh and calf resting on the slings stretched across. Bands of adhesive strapping are applied above the ankle and about the middle of the thigh. A flannel bandage is then applied from the ankle to the middle of the thigh. The strap attached to the hip band is taken up over the opposite shoulder and brought down and fastened to the buckle on the hip band. A patten is worn on the sound foot and the

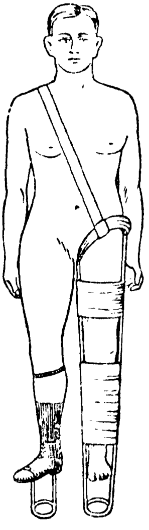


FIG. 123. Thomas's knee splint applied.

Figs. 122 and 123 from 'A Manual of Surgery' by Rose and Carless.

patient walks on crutches to start with; later on they may be dispensed with. Extension may be applied as described on p. 150, in which case the cord from the stirrup is attached to the bar on the splint below the foot.

Thomas's Extension Splint for fractures, see Plate X.

Modified Braun's Splints for fractures of femur, tibia, and fibula, see Plates VI and VII.

Phelps's Box (Fig. 124).—Used in cases of hip or spine disease. This splint consists of a tray rather longer than the child, and fitted with a mattress. The mattress is covered with a sheet and the child is placed in the tray. The legs are wrapped in wool and firmly bandaged in the box by means of flannel bandages which should extend from the ankles to the groins. A wide splint sheet is then passed under the box and carried up over the child's body and secured with safety-pins at the side where the child cannot reach them. The binder should extend from the arm-pits to the hips (Fig. 124). The box is then placed on a blanket, the ends of which are folded over and pinned at the side.

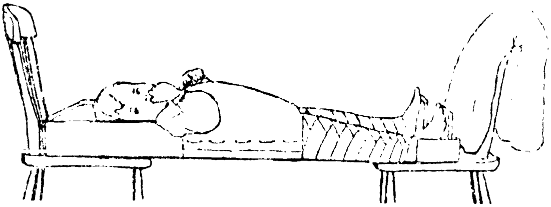


FIG. 124. Phelps's box with child in position.

If extension is needed, the strapping is applied as described on p. 150; the cord is taken through a hole made at the foot of the splint and fastened to a door spring fixed at the side of the box. Counter-extension to the head if required is applied by means of a halter (Fig. 108), the ends being tied to the top of the box or fastened to a door spring at the side. The child is washed without being removed from the box and can be kept beautifully clean. The buttocks need careful attention. After washing, they must be well dried, then rubbed with spirit and powder to guard against any chafing at the edge of the tray. Once a week the child is carefully lifted out. The tray is then thoroughly cleansed and clean sheets and bandages are applied.

Phelps's box has been superseded by the modern plaster shell, or boat, see p. 181.

The Modern Treatment of Fractures by Plaster of Paris Casts

The modern treatment of fractures comprises three principles: absolute and immediate reduction (p. 530), absolute and prolonged fixation, and maximal functional use during the period of fixation. These really basic requirements, as taught by Böhler, of accurate reduction, fixation, and function, are not satisfied by most of the splints whose employment, until recently, was a standard routine in hospitals, and which are still in current use in a great number of hospitals (p. 157).

Plaster of Paris.—Plaster of paris splints, or unpadded casts, are rapidly superseding all other fixation splints, be they of wood or metal. The modern surgeon employs two types of apparatus only: plaster of paris splints and skeletal splints for use with weight traction (p. 159). Plaster of paris provides not only the cheapest but the most efficient method of external splinting, for, by its employment all types of splint can be made. One great advance in the making of plaster splints is the introduction of the modern proprietary plaster bandage—Cellona.[1] These bandages have all the advantages of the hand-made article, with others of their own. Their quality is constant, they keep indefinitely without deterioration, they absorb moisture more rapidly than hand-rolled bandages, and set in five minutes. When set they are stronger, yet less brittle and less bulky than ordinary plaster; the surface is hard, polished, and non-absorbent, the rimmed edges do not crumble, and casts made from them can be bisected, or cut open and sprung apart, without loss of strength.

Application of Unpadded Plaster Cast.—*Technique.*—After reduction, the limb is cleansed with ether soap, strong antiseptics are not used as these kill the skin, and dead skin under plaster forms an excellent nidus for bacteria. The skin is *not* shaved, but may be covered in stockinette. The unpadded plaster cast consists of slabs of varying shapes and sizes which are moulded to the limb, or part, and kept in position by gauze and plaster bandages.

Preparation of Plaster Slabs.—Cellona bandages are prepared with a uniform content of the finest plaster of paris, and it is therefore an easy matter to determine beforehand the number and widths of bandages required for a particular cast. Cellona is also supplied in boxes of fifty pieces, cut to standard sizes. Bandages should be placed at hand with the wrappings removed, in order to prevent delay at a critical moment. A shallow bowl (about 9 inches deep) should be used to hold the water, and a sheet of thick brown paper should be laid at the bottom to prevent adhesion of surplus plaster to the bowl. The inside of the bowl should not be greased, as this has a deleterious action on Cellona. A smooth impervious table-top or glass slab should be placed in a firm and convenient position, and on this it is quite easy to prepare a slab from Cellona. There are two methods of making slabs:

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[1] *Cellona Technique.* T. J. Smith & Nephew Ltd.

(1) The dry method.
(2) The wet method.

(1) *The dry method.*—Preparation of slab. (Plate XIA.) The required length may be measured by laying the dry bandage along the limb and the measurement marked in pencil or with a small nick in the bandage. The necessary thickness is then built up by unwinding the dry bandage to and fro. Usually four to six layers are sufficient for typical fractures. The slabs may be increased in width by placing one above the other, with an overlap to the desired measurement.

Advantages of dry method are: The operator is able to prepare the slab beforehand at his own speed without fear of the Cellona setting before the slab is finished. Pieces surplus to immediate requirements may be put aside for future use—an economy not possible when the bandage has once been wetted.

Application of slab.—The water should be tepid; cold water is likely to cause involuntary muscle contraction, with possible displacement of fragments. On the other hand, hot water will make the bandage set too quickly.

The slab is gripped by the hands at each end and drawn slowly through the water. It is then held vertically to allow excess water to run down, and the upper hand is gently lowered to ' concertina ' the slab in the palm of the other hand, where surplus water is removed by light compression. The degree of this compression will definitely affect the rate of setting—strong squeezing will cause quick setting, and vice versa.

The slab is now extended, placed on the table-top, and carefully smoothed out with the palm of the hand. This procedure of removing bubbles is most important, because without careful attention to this detail the finished slab may subsequently crack or crumble, due to entrapped air-bubbles.

(2) *The wet method.*—This method is recommended for all leg fractures and for all casts over 15 inches in length (Plate XIc).

The bandage is unrolled for 2 inches and placed in the palm of the hand, but it must *not* be gripped. It is then lowered into the water, where it should remain until all bubbling has ceased. The time of immersion depends upon the width and length of the bandage, and varies from about 4 *seconds* for a 3-inch by 3-yard to about 15 seconds for a 6-inch by 6-yard bandage.

After bubbling has ceased the bandage is lifted from the water and the two edges squeezed between the thumb and forefinger of each hand to allow excess moisture to run out. A stout rod is then placed through the central core and the end of the bandage pressed flat on the table-top, where it is held down with the left hand. The end of the rod is gripped by the right hand and the bandage unrolled to the required length and thickness. The finished slab is then smoothed with the palm of the hand to remove air-bubbles, and pulled off horizontally without separating the layers. The slab is then ready for application to the limb.

Ridging and girdering Plaster Slabs.—It is sometimes desirable that a slab should be reinforced to provide resistance to flexion strain or directional stress, e.g. in making posterior shells (p. 180). This may be accomplished by ridging or girdering. In *ridging*, the centre of the slab is raised along its length, forming a longitudinal ridge, which is subsequently folded down on the slab. In *girdering*, an additional slab a few inches shorter than the first slab is ridged and superimposed as shown in Plate XI B. Before strengthening a polished cast the surface should be roughened to ensure close adhesion of the additional slabs.

Cellona slabs are particularly useful for reinforcements because they firmly adhere to the foundation plaster even after it has set. The setting time of Cellona may be controlled as follows:

Immersion solution	*Approximate setting time*
Plain water	5 minutes
With 1 per cent borax (1 tablespoonful to 1 quart)	8 ,,
With $1\frac{1}{2}$ per cent borax	15 ,,
With 2 per cent borax	20 ,,

Technique of Cast Construction.—The Standard Colles's Plaster.—*Method.*—After reduction (p. 530) of the fracture, the arm is held by the assistant, who applies counter-traction on it, with the elbow bent, whilst the surgeon applies traction to the thumb, so that the hand assumes the position of ulnar deviation, the forearm being fully pronated. A strip of adhesive felt, $\frac{3}{16}$ inch thick by $1\frac{1}{2}$ inches wide, is placed round the arm below the elbow.

The Cast.—A dorsal slab is made from a 6-inch by 3-yard plaster bandage (4-inch for a child). This is made 6 inches longer than the measurement of the arm from the bend of the elbow to the metacarpal heads (Fig. 125). The plaster should extend 1 inch from the olecranon process on the extensor surface of the arm, and it should be folded back obliquely (so that it does not press on the antecubital fossa when the arm is flexed). Below, it must reach to ½ inch behind the metacarpal heads, and the excess should be doubled back over the dorsum of the hand (Fig. 126). Care should be taken that the slab extends round to the ventral surface of the radius, and is moulded round the radius and the base of the first metacarpal. Neglect of this precaution may lead to subsequent radial deviation.

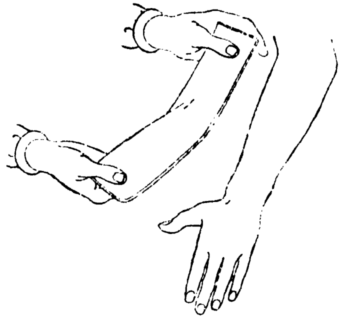


FIG. 125. Plaster slab applied to the dorsum of the forearm.

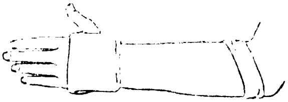


FIG. 126. Excess length doubled back.

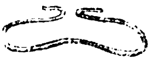


FIG. 127. Copper wire loop.

The slab is well rubbed on to the hand to exclude air-bubbles, and it is fixed to the forearm with a wet gauze bandage, applied from the creases of the wrist to the elbow.

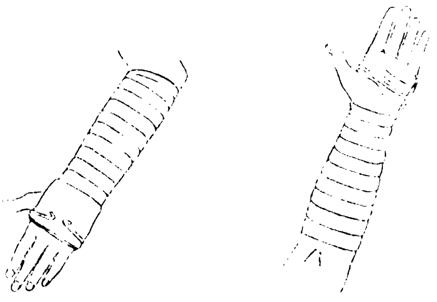


FIG. 128. FIG. 129.
The wire loop in position.

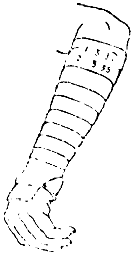


FIG. 130.
Finished Colles's plaster.

A malleable copper wire loop (gauge 12 for adults, 16 for children), covered with rubber tubing, is then made as shown in Fig. 127. This passes round the hand and secures it to the dorsal slab, as shown in Figs. 128 and 129. If the fracture has needed reduction, or if there is much swelling, the plaster is not completed until the next day, the patient being told to keep the hand elevated and not to hang it by his side. At night the arm is elevated above the rest of the body by laying it on a pillow on the chest. In the day a narrow arm sling may be worn.

The following day, should the reduction prove to be satisfactory from a second X-ray, and should the swelling have subsided, the plaster is completed by the application of a 4-inch by 3-yard bandage, applied in a circular manner, over the original gauze bandage, from the elbow to the creases of the wrist (Fig. 130).

Uses.—The standard Colles's plaster is used in:

(1) Colles's fracture, after reduction. The cast is worn for four weeks.

(2) Separated lower radial epiphysis (p. 543) in children. The cast is worn for three weeks.

(3) Greenstick (p. 527) fractures of the lower end of the radius and ulna in children. The cast is worn for three or four weeks.

(4) Fractures of the scaphoid. These are put up in radial deviation and slight dorsi-flexion, and kept up until X-ray shows union, in three months or longer.

(5) Metacarpal fractures.

(6) Difficult finger fractures.

In (5) and (6) the plasters are slightly modified.

Special instructions to patients wearing Colles's plaster splint:

When walking about and not actually using the injured arm, keep the arm across the chest, gripping the lapel of the coat on the opposite side, as long as there is any tendency to swelling. If the injury is below the elbow the arm should be put through the sleeve in about a week's time and the hand used normally.

Use the hand and fingers as much as possible for writing, eating, knitting, ordinary household duties, and lifting light objects: this acts as massage to the part. If the hand cannot be used there is something wrong, and the doctor should be consulted again. The fingers, elbow, and shoulder should be put through their full range of movement at least twenty times a day. All joints not immobilized being actively exercised.

The wire across the palm must be kept pressed in the middle of the palm. It should not press on the skin at the sides or impede the grip of the hand.

After-treatment.—After an arm cast has been removed, the movements of the various joints are tested. Half range of movements should be obtained almost immediately, and full range after fourteen days.

The Full-arm Plaster Splint.—*Method.*—A band of adhesive felt is placed round the arm just below the axilla.

(1) A plaster slab 24 inches long is made from two 6-inch by 3-yard plaster bandages (two 4-inch for children). This is placed on the extensor surface of the arm and forearm, which is held in a flexed position just above a right angle and in mid-position between pronation and supination (Fig. 131).

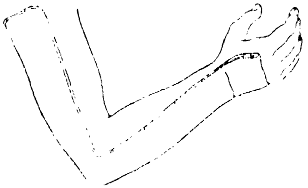


FIG. 131. Position of slab.

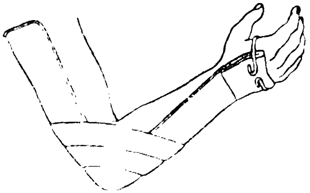


FIG. 132. Elbow encircled.

(2) This is fixed with a wet gauze bandage.

(3) A 24-inch slab made from one 4-inch by 3-yard bandage is placed to encircle the elbow, as shown in Fig. 132.

(4) A 24-inch slab made from one 4-inch by 3-yard bandage is placed round the top of the slab.

(5) A copper wire loop is placed round the hand, as previously described (Fig. 127).

The full-arm plaster splint is used for: (*a*) fractures of the upper third of the radius and ulna; (*b*) fractured head of radius, when the fractured segment is not separated; (*c*) supra-condylar fractures, after swelling has subsided.

Variations of this plaster can be used to hold the forearm in pronation, mid-position, and supination.

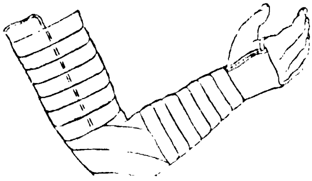


FIG. 133. Finished full-arm cast.

Application of plaster.—A measurement is taken from the axilla, down the inner side of the arm, round the bend of the elbow, up the outer side of the arm to the acromioclavicular joint. A plaster slab is made from two 6-inch by 3-yard Cellona bandages, 6 inches longer than the measurement. It is applied from the axilla, down the inner side of the arm, round the elbow joint, up the outer side of the arm, and over the shoulder, where it is turned back and secured by a strip of Elastoplast, as shown in Fig. 134.

A circular gauze bandage is then wound round the slab; no encircling turns of plaster must be used, only gauze bandage which can easily be split.

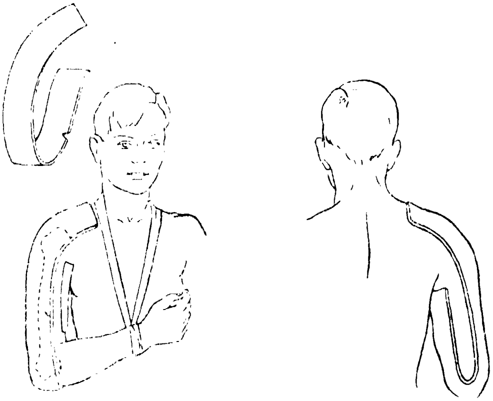


FIG. 134. Slab applied to fractured shaft of humerus.

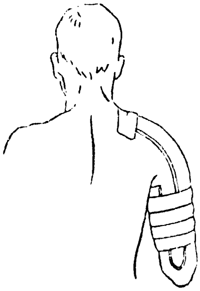


FIG. 135. Slab secured.

The patient sleeps in an upright position in bed, and when walking about has the arm supported as shown in Fig. 136. Active movements of the wrist, pronation and supination of the forearm, and slight flexion and extension of the elbow are commenced immediately. No passive movements are allowed. On the tenth day the patient starts active shoulder movements, and the cast round the elbow joint is cut away to allow of further flexion and extension. The average fracture of the humerus is sufficiently firm at the end of four weeks to dispense with the plaster cast, and three-quarter movement is possible in the elbow. At this stage the patient commences active exercises.

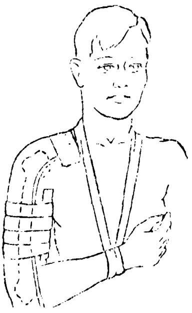


FIG. 136. Finished cast, showing walking position.

Fractures of the Shaft of the Humerus, Lower Third.—As this fracture is so near the elbow joint, a U-slab alone does not give sufficient immobilization to prevent muscle spasm. In this case the elbow must be immobilized, which is done in the following manner:

A strip of wet lint is first applied to the forearm and over the lower part of the U-slab, which has already been applied as described. One 6-inch by 3-yard bandage is made into a slab 15 inches long, and applied over the wet lint. This extends from the wrist to just above the elbow, being moulded to the outer part of the arm, which is kept in the mid-position between pronation and supination (Fig. 137). It is secured to the arm with a wet gauze bandage. The wet lint prevents the slabs adhering together, and on cutting the bandage the forearm slab can be removed. In this fracture the only movements allowed are movements of the fingers and wrist. The forearm slab is removed at the end of two weeks, and movements commenced as described under fracture of the humerus.

Fractures of the Phalanges.—The standard Colles's dorsal slab (p. 165) is first applied to the dorsum of the hand and forearm, and fixed with a wet gauze bandage. A ventral slab is then applied, extending from just behind the metacarpo-phalangeal joint on the palm to the bend of the elbow.

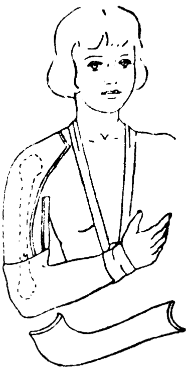
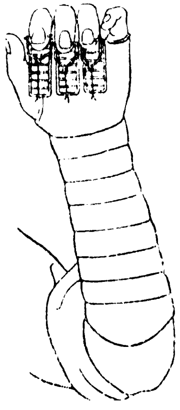


FIG. 137. Finished cast for lower-third fracture of humerus, showing slab.

A Cramer wire splint, ¾ inch wide, which has been bent into a wide U-shape, is padded with adhesive felt on its convex surface, and one end is incorporated in the ventral slab and so fixed that the distal limb of the U extends at least 1½ inches beyond the tip of the finger, as shown in Fig. 140. A Kirschner wire is then



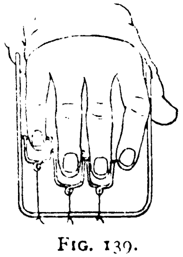


FIG. 139.

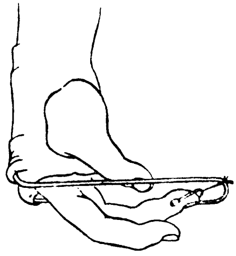


FIG. 140.

Modification used for compound fractures needing traction.

FIG. 138 (*left*). Traction applied for multiple phalangeal fracture with displacement.

introduced through the pulp of the finger, and extension applied from this to the extremity of the Cramer splint. Where many phalanges are fractured the splint is modified, as shown in Fig. 139. The extension is applied for three weeks to a month, after which active movements are commenced. The same method may be used for the intermediate phalanx. Fractures of the distal phalanx need no special splinting.

The Standard Below-knee Cast.—*Bandages required.*—Seven 4-inch by 3-yard and two 6-inch by 3-yard Cellona bandages.

The *method* of application is described by Figs. 141–53. It is essential during the whole process to smooth out all creases and air bubbles before the plaster sets, otherwise the full strength and support of Cellona is not obtained. An alternative to the use of Böhler's walking-iron is now commonly used. The plaster is applied as described, but leaving the toes entirely free for plantar and dorsi-flexion. A leather boot is made to fit over the plaster. This has a heel, and the sole is rockered so as to compensate for the mobility of the ankle joint. See Plate XXVI.

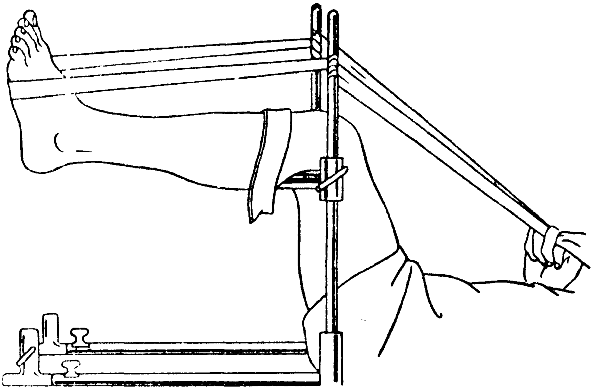
Instructions to patients with below-knee casts.—For the first week following the application, the leg when at rest should be elevated, whether sitting in a chair, or in bed. Pain, due to swelling, may be relieved by raising the leg on firm pillows. For the first week or two, when not actually walking, the leg should be raised on a chair. Patients should walk as much as possible, at first with the aid of two sticks, then one, which should be held in the opposite hand to the injured leg.

Removal of below-knee cast.—A pair of large and small plaster shears, and a plaster bender (Fig. 152) are needed. The patient lies on a table, first on his back, and is asked to dorsi-flex his toes. The plaster is then cut down the middle of the sole as far as the iron, and the plaster sole pulled apart, allowing the toes to plantar-flex, thus freeing the difficult part in front of the ankle. He then turns on his front, and the plaster is cut down the mid-line, so that the lower blade presses on the muscles, not on the tibia, cutting down to the ankle, but only going to the mid-line in the region of the walking-iron. The foot is again plantar-flexed, allowing room for the shears round the curve of the dorsal aspect of the ankle. The cast is then split up the front and back, opened in two halves, hinging about the bottom of the walking-iron. *When no walking-iron is used* the plaster may be cut down either side of the leg and foot (bi-valved), the upper and lower sections may then be used as splints.

Mid-thigh casts are removed in the same way.

After treatment.—After removal of a plaster cast the skin should not be washed, but carefully oiled, and a crêpe bandage applied. The following day it is washed and oiled again if necessary. Movements

FIG. 141. The patient holds the bandage (calico or stout open-wove) to keep the foot dorsi-flexed. Note the foundation strip of felt below the knee, placed at an angle to clear the posterior folds of the knee joint.



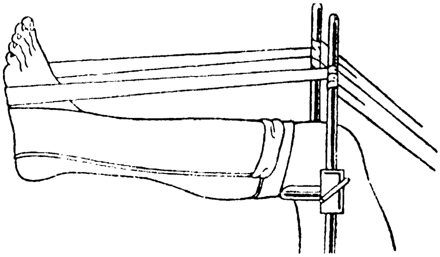
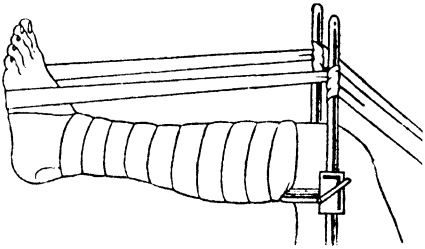


FIG. 142. Two 4-inch by 3-yard Cellona bandages made into a slab, and applied as a stirrup, reaching from the felt on the inner side, around the heel to the inner side, where any excess is turned back.

FIG. 143. The stirrup is rubbed on to the limb to remove air-bubbles and then kept in position by a wet muslin bandage, wound loosely in a spiral manner, from the knee almost to the ankle.



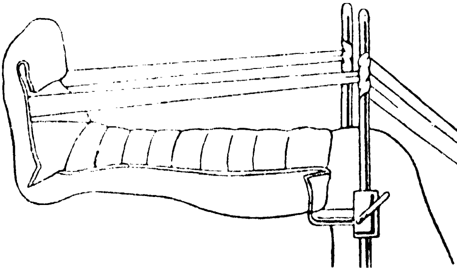


FIG. 144. Two 6-inch by 3-yard Cellona bandages applied in the form of a slab, beginning from the under portion of the felt strip passing down the limb. A cut is made to accommodate the turn at the ankle joint, and the excess bandage is temporarily dropped over the extremities.

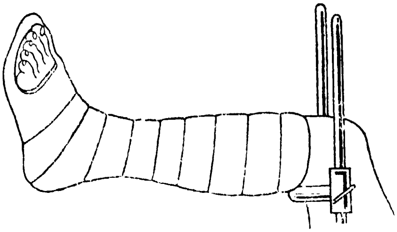


Fig. 145. A 4-inch by 3-yard Cellona bandage applied downwards in a spiral manner, making a narrow pleat with each turn. This pleat allows for slight contraction upon setting, and it should be made each time on the outer or inner surface as convenient; it must not extend beyond the upper edge of the stirrup.

Another 4-inch by 3-yard Cellona bandage is applied from the ankle to the toe-cleft.

The excess dropped over the extremities (Fig. 144) is now turned back (as shown) to give double thickness, and finished slightly beyond the toes.

At this stage the top of the cast is strengthened by a 20-inch slab made from half a 4-inch by 3-yard Cellona bandage. This is placed firmly around the top of the cast and kept in position by the remaining half of the bandage wound round the limb over the slab.

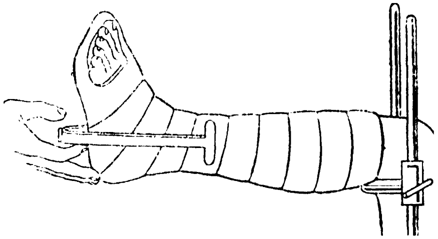


Fig. 146. The iron must be so fixed that the plaster under the toes will clear the ground when the patient walks.

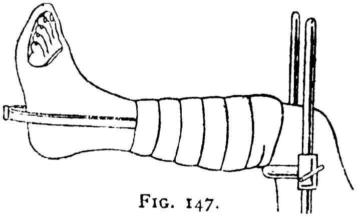


Fig. 147.

Figs. 147-8. The top of the iron is held in position by a 4-inch by 3-yard Cellona bandage, and another similar bandage is used to fix the lower part of the iron.

(If the patient is light in weight, one 4-inch by 3-yard bandage will be sufficient, half being used for each part of the iron.)

Fig. 149a. Alternative method. The heel of rubber applied by means of a 6-inch Cellona bandage.

Fig. 149b. The complete cast.

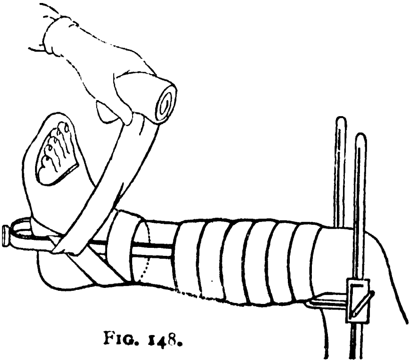


Fig. 148.

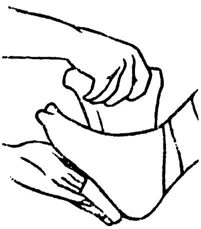


Fig. 149a.

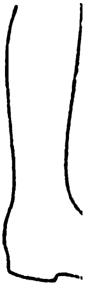


Fig. 149b.

are tested. The mid-tarsal joints are gently manipulated as adhesions may have formed in these joints following the long period of immobilization. Some form of supporting bandage is essential: (*a*) crêpe bandage, or Visco paste if there is no swelling; (*b*) Elastoplast if there is swelling. The bandage is applied to pronate the forefoot, and to invert the hind foot, the heel being covered in.

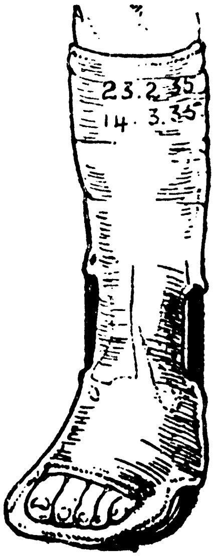


Fig. 150. The completed below-knee cast, pencilled with date of reduction, date for removal, and surgeon's initials, if desired.

The Below-knee Cast, Alternative Method.—It is claimed for the following below the knee cast that the patient, being less self-conscious of his injury, is more willing to practise full ambulatory treatment. (See Figs. 149A, 149B.)

Materials required.—Four 6-inch by 3-yard Cellona bandages; two 4-inch by 3-yard Cellona bandages; one piece Sorbo rubber about 3 inches by 3 inches by 1 inch; one roll sheet wadding, 24 inches by 3 inches.

Method of application.—Where skeletal traction is necessary, it is convenient to apply the plaster with the limb in a position similar to that shown in Fig. 145. If no traction is required, it is desirable to administer local anaesthetic or a general anaesthetic, with the patient on the table. The patient is then drawn forward so that his leg hangs over the end of the table when it is elevated. The knee and ankle joints are bent at a right angle, and the plantar eminence beneath the little toe of the injured leg rests on the knee of the surgeon, who is seated on a stool at the foot of the table. A turn of 3-inch wide sheet wadding is then applied round the leg in the region of the tubercle of the tibia to protect the peroneal nerve from pressure, and a similar turn of wadding is applied round the toes. Two 6-inch bandages are then made into a slab, moistened and applied from the wadding below the knee (popliteal space) downwards over the calf, heel, and sole. A cut is made to accommodate the turn at the ankle joint, and the excess bandage is temporarily dropped over the extremities. One 6-inch bandage and one 4-inch bandage are applied downwards in a spiral manner, making a narrow pleat with each turn. This pleat is intended to allow for slight contraction upon setting, and should be made with each turn on the outer or inner surface as convenient. The excess of the slab previously dropped over the extremities is now turned back to give a double thickness of sole, and finished about a quarter of an inch beyond the toes. This sole is fixed by the application, spiral fashion, of a further 4-inch bandage round the foot in such a manner that the toes are covered on the flexor side: the extensor side as far as the base of the toes is left free of plaster. Another 4-inch bandage is applied spirally round the ankle to strengthen the point of possible flexion. Finally, a piece of 1-inch Sorbo rubber is cut roughly to the size and shape of a normal boot heel, applied to the plaster where the heel would be, and is bound to the plaster with the fourth 6-inch bandage.

The uncovered portion of the wadding is turned back on to the plaster at the top below the knee, and at the foot behind the toes, to prevent the plaster irritating the limb.

Mid-thigh Cast.—This is made in two sections: first to the knee as described, and then to the mid-thigh, with the knee in extension as follows:

(1) A piece of adhesive felt $1\frac{1}{2}$ inches wide and $\frac{3}{16}$ inch thick is placed round the mid-thigh.

(2) A slab 30 inches long is made from two 6-inch by 3-yard bandages. This is applied to the front of the thigh with a small fold back at the upper end from the adhesive felt above to 8 inches down the tibia. The surplus is cut off and applied over the junction of the two plasters.

(3) A back slab is made from two 6-inch by 3-yard bandages. This is applied to the back of the thigh.

(4) These slabs are fixed to the limb by two 4-inch by 3-yard bandages, applied in a circular manner.

(5) A 4-inch by 3-yard bandage is made into a slab and applied to go round and strengthen the top.

(6) When the patient has large thighs it is advisable to apply, in addition, two lateral slabs made from 4- or 6-inch bandages, according to the size of the limb.

This cast is used in the following conditions:

(1) Third degree Pott's fracture (p. 540).

(2) Pott's fracture in corpulent women, where the below-knee cast does not produce sufficient immobilization to enable them to walk without pain.

(3) Fractures of the lower third of the tibia (p. 540).

The Full-length Walking Cast.—This splint extends from the toes to the tuber ischii and is unpadded, except for the top, which is constructed similarly to the top of a walking caliper. The cast is made in two parts. First the standard below-knee cast (Fig. 150) is applied to the knee in flexion. The knee is then straightened and the cast continued to the tuber ischii. The padded ring is made as follows:

Padded ring.—A 4-inch by 2-yard domette bandage is sewn round a ¾-inch roll of grey hospital felt, the felt being cut to the exact length of the circumference of the limb round the level of the tuber ischii. The padding, which is now in a roll form in the middle of the bandage, is put round the top of the thigh so that it lies in the gluteal fold. It is knotted once over the great trochanter and then carried over the opposite shoulder, where it is again knotted.

The cast is made as described below, and during the whole process of application the plaster is being constantly rubbed by the operator's hand to remove air-bubbles.

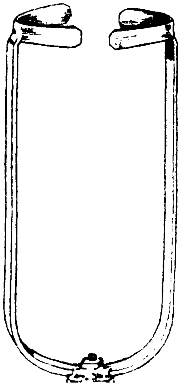
The cast.—(1) Anterior slab, 40 inches long, consisting of two 8-inch by 3-yard bandages, is applied from the ring at the top to 8 inches down the tibia over the lower cast. The surplus is cut off and put over the junction of the two casts, as before.

A similar back slab is applied.

(3) Two lateral slabs are made, each from two 4-inch or 6-inch by 3-yard bandages, according to the circumference of the thigh.

(4) Two 6-inch bandages applied spirally now connect these four slabs together.

(5) The top of the cast is now completed by a slab made from a 4-inch by 3-yard bandage. Before this is applied, the ends of the domette bandage are cut off 2 inches from the knot over the great trochanter, and these ends are turned down and incorporated in the plaster.



Medical Supply Assoc.

FIG. 151.
Böhler's walking-iron.

(6) When the cast is dry the top is lacquered to preserve the surface, and enable the cast to be washed when soiled with excretions.

Uses.—Fractures treated with this cast.—Comminuted fractures of the lower third of tibia (p. 540); fractures of mid and upper third of tibia.

Skeletal Traction (see also p. 152).—In difficult fractures which need skeletal traction for reduction, the leg is placed in a Böhler's apparatus after a Kirschner wire has been introduced through the heel (Fig. 107B). Screw traction is applied from the Kirschner stirrup to the tension screw. A spring balance is used to prevent overpulling. The foot is kept in the correct position, thus:

(1) The pull is exerted on the outer side of the stirrup to invert the heel.

(2) The toe is slung from the cross-frame.

After reduction has been performed the limb is supported, as shown in Fig. 107, and the standard below-knee cast (p. 150) is applied. Slots are cut in the stirrup, and back slabs to make room for the Kirschner wire. When the plaster is completed the wire is immediately removed.

Plaster Jacket.—The plaster jacket should have three main points of bearing:

(1) The manubrium sterni.
(2) The symphysis pubis.
(3) The central bearing on the back at the site of the fracture.

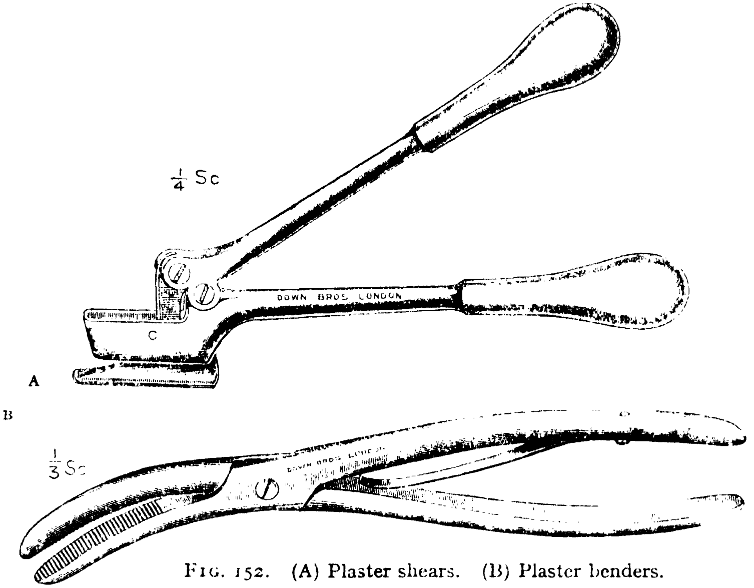


FIG. 152. (A) Plaster shears. (B) Plaster benders.

These three points must be carefully padded to prevent pressure sores. Felt ¼ inch thick is used for this purpose.

Position of patient.—The patient is suspended as in Plate XII A between the two supporting tables so that he is resting on the arms in front and the thighs behind, the symphysis pubis being bare. The legs are strapped to the table, as shown in the picture. A broad webbing band is placed round the chest and is attached by means of a pulley block to a hook in the ceiling, and this is tightened until the patient is suspended with his arms just resting on the front table. A head support is used in high fractures, as shown in Plate XIII.

After about 10–15 minutes, when the abdominal and anterior vertebral muscles have relaxed, the deformity will be seen to disappear. A tube of stockinette, which is shown in Plate XIII, round the thigh, is pulled out to fit tightly round the body. Over this ¼-inch grey hospital felt is applied to completely encircle the trunk, extending downwards to a circle at the level of the greater trochanters of the femur and upwards to the sternal notch anteriorly. This is cut away round the arms and sewn tightly across the back. This requires tailoring beforehand, so that it fits the hips perfectly.

Application of plaster.—Two circular 8-inch Cellona bandages are wound with firm pressure round the trunk. The rest of the cast is made from eight slabs 35 inches long, each made from two 6-inch by 3-yard Cellona bandages. These are applied in the following order:

(1) Round the pelvis.

(2) Obliquely starting with the middle of the slab on the sternum anteriorly, sweeping downwards below the axillae, and crossing on the back in the region of the sixth dorsal vertebra.

(3) A second slab is applied in the same way as No. 2.

(4) One slab is doubled and applied laterally from just below the axillae, down the side of the body, to the lower margin of the cast just above the greater trochanters.

(5) A similar slab is placed on the opposite side of the body.

(6) A central double slab is applied down the centre of the body from the sixth dorsal vertebra to just above the tip of the coccyx.

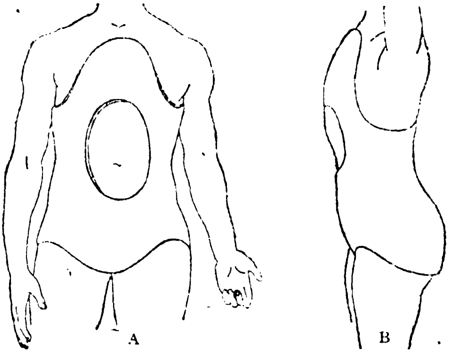


FIG. 153.

Front view of jacket used for fractures of the lumbar region of the spine.

Side view. Note how cast is cut away round the arms to allow of free arm action, also at groin to allow the patient to flex the thighs.

(7) A slab consisting of two 8-inch by 3-yard Cellona bandages is then placed anteriorly from the sternal notch to the symphysis pubis. When in position, all the slabs are carefully rubbed with the hand to expel all air bubbles.

Two 8-inch by 3-yard bandages are then wound on in a circular manner, and this completes the cast. The cast should be so applied that there is a minimum of cutting away to be done. The oblique slabs should be so placed that cutting to allow arm action is unnecessary. Two semicircular cuts should be made in the groin to allow flexion of the legs.

Finishing and trimming the cast.—The lower edge of the cast should be reinforced by means of a 4-inch by 3-yard bandage applied in the following manner: A slab is made 20 inches long, and this is doubled on itself to make a slab 2 inches wide, which is then placed round the lower margin of the plaster. This produces a strong rim, which does not break when the patient sits on the plaster or lies in bed. If all the edges are reinforced in this way, very much less plaster can be used in the main body of the cast.

A window is cut over the upper abdomen, to allow for abdominal breathing and to avoid discomfort after meals. The padding is cut round the window, ½ inch from the plaster edge. This is turned outwards and fastened to the plaster edge by means of the finishing bandage. The window should be edged with a 4-inch bandage to give it a neat appearance. Just before the plaster sets hard, the upper edges are rolled outwards with the finger and polished with french chalk.

The Fillet Plaster.—*Method of construction.*—The jacket is fashioned with a series of slabs over the usual vest with small pieces of adhesive sponge rubber or felt applied to protect the anterior superior spines and sacrum.

The following slabs are required and measurements are taken on the patient before suspension (Plate XIII c):

(1) Posterior slab. Seventh cervical spine to mid-sacrum.

(2) Anterior slab. From sternal notch to pubis.

(3) Anterior and posterior slabs. Between mid-axillary lines, anteriorly and posteriorly.

(4) Waist slab. Waist measurement.

(5) Two temporal. Temple to thyroid cartilage in front of the ear.

(6) Occipital slab. Distance between mastoid prominences posteriorly.

(7) Two shoulder slabs. From nipple, across shoulder to angle of scapula.

Method.—Cellona, in the dry state, is folded five or six layers thick, using full width (18-inch) material for the large anterior and posterior slabs, and dry 4-inch and 6-inch bandages, refolded, for the smaller slabs. The large slabs are fitted roughly whilst dry, a small yoke cut at the neck and small notches made laterally to ensure a close fit without creasing (Plate XIII).

The patient is slung on a gallows apparatus, domette or flannel bandages being used, care being taken to obtain a smooth fitting behind the head. The patient is then placed in the desired position, and the shaped posterior slab, held in both hands, is immersed in tepid water. After squeezing out excess water, the slab is applied as quickly and smoothly as possible. The anterior slab is next applied. The edges of the slabs are folded outwards to afford strength, and the cast further reinforced by the application of two shoulder slabs and a waist slab. The slabs are maintained in position by means of a 6-inch Cellona bandage, particular care being taken with the moulding (Fig. 154). In the fillet plaster, the value of the splint is dependent upon the support taken from the pelvis. The jacket is moulded on the soft tissues immediately above the pelvic brim. Moulding direct on to a bony prominence will give rise to discomfort and sores, and should be avoided.

Two 3-inch Cellona bandages are applied smoothly, but not tightly, around the neck circularly or in overlapping 'V's.' The temporal slabs are applied from the temple to the angle of jaw, crossing in front of the thyroid cartilage. A 2-inch bandage is wound round the forehead and the occiput and the intervening space filled with a small occipital slab, which also serves to unite the head and neck portions of the jacket. A further 3-inch bandage strengthens the neck portion and covers the 'V' folds and slab joints. The strength is then greatly increased, particularly along the direction of torsional strain, by the application to the cast of narrow slabs drawn up between the fingers into longitudinal ridges.

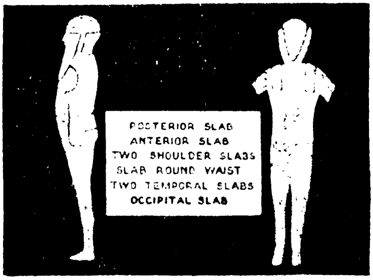


FIG. 154. Order of slab moulding.

On removal from the suspension apparatus, the plaster is cut round the ears and a ventral opening made as indicated in Plate XIV B, drying completed, and the edges bound in the usual manner.

A plaster jacket or a plaster jacket with fillet is used for treatment in the later stages of tuberculous disease of the spine (cervical and high dorsal spine), some forms of scoliosis (p. 620), and certain fractures of the spine. For treatment of disease of the lower dorsal, dorso-lumbar, and lumbar segments, the posterior shell will provide effective primary immobilization (p. 181).

Double-hip Spica.—In the later stages of hip disease (p. 615), when re-ossification is in evidence and abscess formation less likely, plaster splintage is of great value. The hip joint is fixed in a double-hip spica, which is retained until healing is well advanced, when it is replaced by a single spica. This permits massage and exercises to improve the tone of the soft tissues prior to the commencement of ambulatory treatment.

Method of construction.—To the trunk and legs, woollen or stockinette vest and leggings are fitted with pads of adhesive sponge rubber or felt adhered over the bony points, viz. anterior spines, heel, and malleoli. Plaster bandages 6 inches wide are applied over the pads, the site of the groins being reinforced by additional layers pleated obliquely. Dry slabs, six layers thick, made from Cellona 8 inches wide (or other suitable width), are then prepared as follows:

(1) Four groin slabs to fit anteriorly and posteriorly on both thighs. These are measured from umbilicus to above knee.

(2) Two slabs to cover the front and back of affected leg. These extend from the knee to the ankle.

(3) One hip slab, which should girdle the pelvis.

(4) One rib slab to pass circumferentially round the subcostal margin.

(5) Two small slabs for inside of upper thighs.

The foot is supported at right angles to the leg by means of a plantar slab extending beyond the toes and held in place by means of a 4-inch Cellona bandage, enclosing the foot but not the toes. A fold of lint may be included along the front of the leg and foot under the plaster. When the cast is hard the fold may be removed, thus relieving all pressure points on the front of the ankle. The finished cast is strengthened by ridged slabs (Plate XIV D) at points of potential weakness.

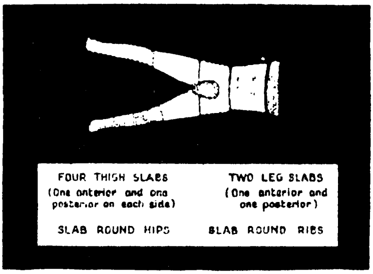

FOUR THIGH SLABS
(One anterior and one posterior on each side)
TWO LEG SLABS
(One anterior and one posterior)
SLAB ROUND HIPS
SLAB ROUND RIBS

FIG. 155. Slabs for double-hip spica.

The cast should be carefully moulded into the hollows around the bony prominences of the heel, knee, and pelvis, and should extend upwards to a point immediately above the subcostal margin. Anteriorly an adequate window is cut to allow for abdominal distension. Fig. 155 shows completed double-hip spica mounted on a drying frame.

Posterior and Anterior Shells.—A thin plaster shell is all that is necessary, as it may be suitably reinforced after removal from the patient. Shells are moulded in appropriate positions, and as soon as set may be easily removed. Slabs and ridging are used to provide adequate strength and the shells appropriately lined and padded with lint, felt, sponge rubber as and where required. Edges are trimmed, and the plaster cut at the buttocks for sanitary reasons, also below the axilla in order to prevent pressure on the arms which may cause nerve pains or paralysis.

An anterior shell is required when the patient is nursed in a ventrally recumbent position, and a posterior shell for dorsally recumbent nursing.

Posterior Shell (Boat).—*Method of construction.*—The patient is placed on the appropriate frame. The following slabs are required: Central slab; shoulder slabs; thigh slabs; cross slab; legs made by bandages.

Rough measurements are made of the slabs to be used, and these are prepared by folding dry Cellona bandages and full-width material, five or six layers thick, to the required sizes. A smooth base on which to apply slabs, and an even inner surface to the shell are obtained by 6-inch bandages applied transversely over the back and lateral surfaces of the body and limbs. Plaster bandages are applied to the side of head and neck. Further slabs are applied and are then held in position by 6-inch bandages pleated obliquely. Where flexion strain is anticipated, additional strength is secured by ridging. The shell is removed, and after binding and cutting it is mounted on a stand and used as in Fig. 157.

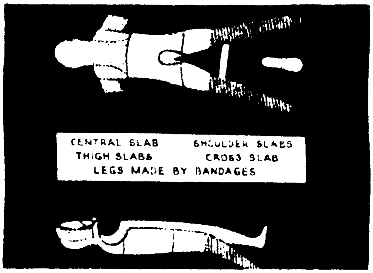


FIG. 156. Diagram of slab.

Anterior Shell.—*Method of construction.*—For the construction of this shell an adjustable frame may be employed. The application of slabs follows the lines adopted for a posterior shell.

Slabs required: Central slab; two thigh slabs; two shoulder slabs; two lateral slabs; slab to form wings.

Lateral wings are formed from a Cellona plaster slab in which is incorporated Kramer wire.

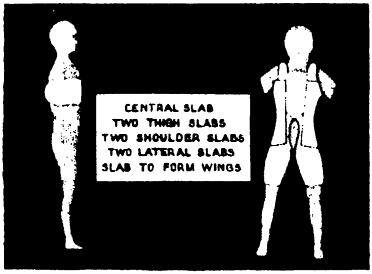


FIG. 157. Slabs for anterior shell.

Hip or spica plasters are employed at certain stages of disease of the hip joint.

Plaster splints should be as light as possible, consistent with adequate strength. It is unnecessary to apply plaster of equal thickness throughout the cast, but where flexion strain is anticipated the cast should be reinforced (p. 164). The incorporation of other materials, such as wood and metal strips, is not advisable because the rates of expansion and contraction differ from that of plaster, causing such materials to work loose. Additional strength is best obtained by ridging (p. 164).

Cellona Plaster of Paris in the Treatment of Ulcers and Septic Conditions.—The value of Cellona plaster of paris bandages is by no means limited to the treatment of fractures. Immobilization, which is so necessary in fractures, is found to be of equal importance in the treatment of certain inflammatory conditions, both acute and chronic. In the case of involvement of the limbs by local sepsis, ulceration, cellulitis (p. 569), or lymphangitis immobilization and elevation are of paramount importance. Where ulceration is present it is necessary to insert a window in the plaster, see Plate XIV B. The average duration of these infections is found to be reduced by more than half.

Removal of plaster casts is most easily accomplished by the use of plaster shears (Fig. 152), which are made in varying sizes according to the size and thickness of the plaster to be removed. After removal, the limb is oiled to remove dead epithelium. After this the movements are tested. Some form of supporting bandage is usually applied for a time, see p. 173.

To prepare Plaster of Paris Bandages by Hand.—Plaster bandages are made of crinoline, a loose-meshed coarse book-muslin. Cut and make the bandages 5 yards long and from 2 to 6 inches wide as required (p. 129). Remove 4 strands from all cut edges to prevent fraying. When loosely rolled, place them on a smooth, clean, dry table or slab, either glass or zinc covered. Have ready well-dried plaster of paris and rub it thoroughly into the bandage by hand, unrolling a few inches of bandage at a time and re-rolling it loosely by hand as the plaster is incorporated. When finished, place carefully in a tin box and cover with oiled paper to exclude the air, from which plaster of paris readily absorbs moisture. Keep the tin firmly closed and in a warm, dry place. Before commencing to use plaster, it is well to protect the hand by the use of rubber gloves or grease to prevent the skin from becoming irritated or roughened by the plaster of paris.

CHAPTER V

GENERAL OBSERVATIONS OF SYMPTOMS

One of the most important functions of a nurse is that of observation. An observant nurse, possessing a knowledge of the relative value of facts observed, and the power of accurately describing the same, is a great assistance to the medical officer.

Observation regarding the following must be made in all cases, and any abnormal symptoms found should be reported. These symptoms are called **Objective Symptoms.** They include: 1. Sputum, vomit, faeces, urine, menstruation, sweat; discharges from eyes, nose, ears, vagina, urethra, and rectum. 2. Skin, condition of the body, weight. 3. Temperature, pulse, respiration. 4. Mouth, breath. 5. Rigors, shivering, tremor, twitching. 6. Hiccough, cough. 7. Flatulence, distension. 8. Posture, facial expression, eyes. 9. Sleep, appetite, strength. 10. Restlessness, delirium, coma, unusual cries.

Subjective Symptoms are those complained of by the patient and include pain and discomfort, nausea, giddiness, bad dreams; defects in sight, hearing, taste, smell, and touch; loss or alteration of sensation and power.

Objective Symptoms.—1. A. The Excreted Sputum.—Note and measure the quantity; note the consistency, thick, watery, tenacious; odour, offensive or otherwise; colour; presence of blood. Various kinds of sputum are:

(*a*) **Mucoid** is a thin, colourless expectoration composed chiefly of mucus, seen in catarrhal conditions generally, or viscid as found in the early stages of bronchitis (p. 248). Most town dwellers expectorate a little mucus with black specks in the morning.

(*b*) **Muco-purulent** is thick, tenacious, greenish-yellow, and inoffensive, and may have a faintly sweet odour. It occurs in the later stages of bronchitis (p. 248), pneumonia (p. 251), and tuberculosis (p. 318).

(*c*) **Purulent**, composed almost entirely of pus, is yellow, thick, and often offensive. Seen in abscess of the lung (p. 262) and suppuration in phthisis, or in bronchiectasis (p. 249).

(*d*) **Rusty** is a muco-purulent sputum with a rusty tinge, and is met with in pneumonia (p. 251).

(*e*) **Prune Juice.**—Dark brown semi-solid sputum, seen in severe cases of pneumonia (p. 251), gangrene (p. 261), or new growth in the lung.

(*f*) **Blood.**—The sputum is bright red, mixed with air bubbles, and has a frothy appearance, known as haemoptysis. Occurs in phthisis and after rupture of a vessel in the lung. The quantity is important, a few specks or streaks being common after paroxysms of coughing. The blood is fluid or clotted in phthisis and in a larger quantity. It is most important to notice if blood is present in the sputum during the next few days and if it alters in colour. These two conditions are common in tuberculosis (p. 318).

(*g*) **Red-currant Jelly.**—Sputum has the appearance of red-currant jelly, considered indicative of cancer (p. 262).

(*h*) **Nummular.**—Consists of separate, small, round, semi-solid masses, denser than the usual forms of sputum. When placed in water it sinks and assumes the form of a disc. Occurs in phthisis when cavities are present.

(*i*) **Gangrenous.**—Greenish or of a dark colour with the characteristic foetor of gangrene. Occurs in gangrene of the lung or air passages (p. 261).

B. **Vomit.**—Note quantity, colour, reaction, consistency, odour, number, and method of ejections, and the time at which it occurs in relation to food or medicine.

Vomit simply regurgitated as an overflow of food directly it has been taken occurs commonly in infants (posseting) who have taken the food too quickly. It may also be brought up in mouthfuls constantly and without effort (puking); this also occurs in cases of peritonitis (p. 512). The vomit may be ejected forcibly and without any relation to food, or occurs in cerebral disease or with pyloric obstruction, and is known as *forcible* or *projectile* vomiting. Vomiting unattended by nausea may occur in uraemia (p. 238), hysteria (p. 392), and certain neuroses of the stomach. Profuse vomit ejected in large quantities, frothy and fermented, occurs in pyloric obstruction with dilatation of the stomach (p. 515).

Consistence of Vomit.—(*a*) **Clear Fluid** occurs when the stomach is empty of food. It is commonly met with in hysterical patients and in pregnancy (p. 690).

(*b*) **Partly Digested Food.**—This has a sour taste and odour.

(*c*) **Yellow or Yellowish-green Clear Fluid, very Acid,** occurs when the stomach is empty of food, as in post-anaesthetic vomiting (p. 457); also in bilious vomiting, in cases of gastritis and pregnancy (p. 690) with morning sickness.

(*d*) **Coffee-ground Vomit** has the appearance of coffee grounds, due to altered blood which has remained in the stomach for some little time. It occurs in gastric ulcer (p. 219), after gastric operations (p. 506), or may result from irritant poisons or lesions in the stomach or duodenum.

(*e*) **Blood.**—*This is known as haematemesis; the blood may be* bright, if in large quantity or vomited immediately, or altered. Fresh blood has the appearance of blood mixed with mucus or particles of food and is not frothy. Occurs in gastric ulcer or after operations or injury, cancer, etc.

(*f*) **Purulent Vomit** consists of pus mixed with the contents of the stomach. Occurs when an abscess has burst into the stomach.

(*g*) **Faecal Vomit** resembles beef tea, has a faecal odour, and occurs in intestinal obstruction (p. 513). Later in this condition solid faecal matter may be vomited.

(*h*) **Brown Vomit** rather resembles faecal vomit except that it has not a faecal odour; it occurs in peritonitis (p. 512).

Reaction of Vomit.—Vomit should be tested with litmus paper to see whether it is acid or alkaline (for test see p. 35).

Foreign Bodies may be present in the Vomit.—Objects swallowed accidentally, or on purpose by hysterical or mental patients, may be coins, pins, hair, nails, etc. Worms—the round worm (p. 227) is the one most commonly found in vomit.

C. **Faeces.**—Note the presence of mucus, pus, sloughs, blood, fat, undigested food, worms, and foreign bodies, also the consistency, form, and colour of the stools (p. 186).

(*a*) **Mucus** gives the stool a slimy appearance and occurs in colitis (p. 223). When the mucus is mixed with faecal matter it indicates that the irritation is in the upper part of the bowel; when in flakes or masses, or on the surface of the stool, that the trouble is nearer the rectum.

(*b*) **Pus** is not easily seen when present in small quantities. When passed in small quantities mixed with the faeces it is indicative of intestinal inflammation; passed in large quantities either with or without a stool it is usually the result of the rupture of an abscess.

(*c*) **Sloughs.**—These have the appearance of greyish wash-leather and occur in the later stages of typhoid (p. 341).

(*d*) **Blood.**—This may appear as bright red blood unmixed with faeces; occurs in haemorrhoids (p. 279) and diseases of the lower end of the rectum. If intimately mixed with the stool it indicates that the cause is higher than the rectum; when tarry, that the blood comes from high up in the intestinal canal. *Causes*—Ulceration, inflammation, traumatism, intussusception, piles, and fistula.

(*e*) **Fat** may be distinguished as fat or the stool may present a glistening appearance. Occurs in disease of the pancreas (p. 234). The colour of the stool in cases of jaundice (p. 232) is largely due to undigested fat.

(*f*) **Lientery.**—Undigested Food is found in *lienteric* stools. Irritation of the stomach and intestine with rapid passage of the food through the alimentary tract accounts for the condition.

(*g*) **Foreign Bodies.**—These may consist of objects accidentally swallowed, such as coins, pins, fruit stones, etc., or of gall stones, larvae of insects or worms (p. 225).

Consistency.—A normal stool should be formed or semi-formed and of one consistency throughout. When the lumen of the intestine is narrowed owing to the presence of a tumour, the stools may be flattened (tape-like) or grooved. In stricture, the stools may appear round, small in diameter, and are known as 'pipe-stem' stools. Note must be made as to the presence of any of the following conditions: constipation, diarrhoea, or incontinence of faeces.

Constipation.—The stool is dry, hard, and darker in colour, or it may be light yellow and gritty; defecation is difficult.

Diarrhoea.—The stool becomes loose, liquid, and watery, and the frequency is increased.

Watery stools are of very thin consistency; the movements of the bowel are accompanied with acute cramping pains; occur in dysentery (p. 224) and cholera (p. 344).

Impacted Faeces.—The faeces become impacted in the rectum as a result of constipation. Diarrhoea may be present without causing any of the impacted faeces to be expelled.

Colour.—*Normal colour,* light yellow to dark brown.

Yellow stools occur in patients fed entirely on milk diet.

Green.—Found in unhealthy stools, caused by the action of intestinal bacteria.

Greenish-yellow.—Of the consistency of pea-soup with an offensive odour, characteristic of typhoid (p. 341).

Black.—May be due to partly digested blood (melaena), or to drugs such as iron, bismuth, charcoal.

Clay colour.—Results from the absence of bile in the stool and incomplete absorption of fat. It occurs in jaundice (p. 232).

Silvery stools of a peculiar glistening appearance occur in some forms of disease of the pancreas (p. 234).

D. **Urine.**—Note the quantity, colour, clearness, odour, both when first voided and after standing; also the presence of sand, gravel, or foreign bodies. Note the frequency and time of micturition, also the presence of either of the following conditions: incontinence (p. 238), retention (p. 238), suppression (p. 237).

(*a*) **Quantity.**—The normal quantity passed in 24 hours is from 2 to 3 pints.

(*b*) **Colour.**—*Normal colour,* amber.

Orange-red denotes excess of pigment.

Smoky, or blood-red, denotes blood.

Porter colour denotes bile.

Milky denotes chyle, pus, or mucus.

Pink sediment denotes urates.

(*c*) **Clearness.**—*Opaque,* due to a quantity of blood, bile, mucus, or pus (p. 237).

Turbid on cooling denotes urates (p. 35).

Light flocculent cloud floating in clear urine denotes mucus (p. 38).

Phosphorescent, due to excess of phosphates.

(*d*) **Odour.**—On decomposition, the urine becomes ammoniacal; if ammoniacal on passing, cystitis is present. Certain drugs give the urine a characteristic odour. Abnormal urine may contain albumin, casts, pus, blood, sugar, bile, chyle, phosphates, and urates. See p. 35. (For urine testing see Chapter II, p. 35.)

E. **Menstruation** (p. 686).—Note the regularity, amount, and character of the flow; whether normal in colour and odour, scanty or profuse, dark or pale; presence of clots or shreds of membrane. If pain is present, note the time at which it occurs and its position.

F. **Sweat.**—Note the presence or absence of sweat; the quantity, odour, and whether sweating is general, localized, or unilateral; whether it is persistent or intermittent; and the time at which it occurs (p. 412).

G. **Discharges from the Various Orifices.**—Note the amount, colour, consistency, and odour of the discharge.

Otorrhea is discharge from the ear.

Leucorrhea is discharge from the vagina.

2. **Skin.**—Note the condition of the skin, whether hot or dry, or moist, cold, or clammy; presence of any undue redness or pallor; presence and locality of sores, scars, eruptions, abrasions, swellings, oedema, or discoloration; whether the surface is rough or smooth; also the condition of the nails, whether they are clubbed, furrowed, discoloured, blue, or brittle (p. 412).

The following conditions of the skin may be observed apart from those mentioned under skin diseases (see Chapter XI) or rashes occurring in infectious fevers (see Chapter VIII).

A Hot Dry Skin generally accompanies increase of temperature (p. 192), and a change from dryness to a warm moist condition is a favourable sign.

Cold Skin generally accompanies a subnormal temperature, and may be due to exposure, lack of food, or defective circulation.

Clammy Skin, or a *cold perspiring skin,* usually accompanies shock (p. 561), and is often a sign of extreme prostration. It is also a herald of approaching death (p. 207).

Excessive Moisture of the Skin (sweating) (p. 412) may be produced by exertion or be due to general disease, as in tuberculosis (p. 318) and rickets (p. 601) (night sweats), or to disease of the sweat glands (p. 412); also in sepsis and many acute diseases.

Absence of Sweat may be due to general disease, as in nephritis (p. 241), or to disease of the sweat glands (p. 412).

Pallor.—Abnormal pallor of the skin and mucous membranes may result from deficient circulation; from disturbance of the heart's action, as in fainting (p. 547) or heart disease (p. 268); from contraction of the superficial blood vessels, as in exposure to cold (p. 552); or from deficiency in colouring matter of the blood, as in anaemia (p. 283).

Cyanosis, or blueness of the skin and mucous membranes, occurs when the blood is not sufficiently oxygenated. It may be caused by obstruction in the respiratory passages or organs; by conditions causing congestion of the venous circulation, as in valvular heart disease (p. 269); or from failure of the nerve-centres controlling the respiration and the action of the heart, as in collapse (p. 562). It is sometimes congenital.

Colour.—The colour may be changed as a result of a disease, as in jaundice (p. 232) where the skin and the conjunctivae become yellow; local bronzing of the skin in patches occurs sometimes in pregnancy (p. 690); simple anaemia produces marked pallor of the skin and mucous membranes; pernicious anaemia (p. 284) produces a lemon tinge of the skin and mucous membranes, the eyes remaining clear; pigmented areas are associated with Addison's disease (p. 299) and the prolonged administration of arsenic and other drugs. In cancer (p. 314) the skin assumes a yellowish-green, or dirty tinge (cachexia). *Saturnine cachexia* occurs in lead poisoning (p. 383) and is marked by anaemia; the skin is of an earthy tinge.

Rashes.—Rashes are cutaneous eruptions of an inflammatory nature and may be due to the action of toxins; to the use of certain drugs; to local irritations or inflammations; to animal or vegetable parasites; to subcutaneous haemorrhages. Rashes may be diffuse or circumscribed, and are described by the following terms:

Erythema.—An erythematous rash gives the skin a bright red appearance, like a diffuse blush. Sometimes on close examination it appears to be made up of minute scarlet points in close proximity; this variety is known as punctiform. This type of rash occurs in some of the exanthemata (see Chapter VIII), also in so-called *accidental* rashes which may be due to certain drugs, plants, enemata (enema rash), or eating unsound food.

Macules (*maculae*).—A macule is a small discoloration of the skin without disturbance of the surface or consistence. It does not disappear on pressure. Brown macules are observed in freckles (lentigo), chloasma; dark spots resulting from general disease as in syphilis (p. 322), Addison's disease (p. 299); after prolonged use of arsenic; from irritation of the skin, from the action of chemicals, blisters, scratches, and heat; and in some skin diseases. White macules occur in certain skin diseases.

Petechiae (*purpuric spots*).—These are small purple points occurring under the skin, the result of minute haemorrhages. The rash is often described as a haemorrhagic rash. They occur in certain general diseases such as scurvy (p. 304), purpura (p. 286), in severe cachexias and anaemia, in some acute infectious diseases. They may also be caused by body lice (p. 426) and other parasitic affections; venous stasis, occurring in paroxysms of whooping-cough; and to certain toxaemic conditions such as poisoning by phosphorus, snake venom, etc. A purplish discoloration of the skin in larger patches is known as *ecchymosis*. Small linear haemorrhages are called *vibices*.

Papules (*pimples*).—A papule is a small elevation above the surface of the skin varying in size from a pin-head to a pea.

Nodules.—A nodule is a more spherical and deep-seated alteration of consistence of the skin, and may rise above it or be buried in it, as in lupus (p. 421).

Wheals (*pomphi*).—A wheal is an oedematous elevation of indefinite size, but usually more or less round. In many cases the centre is pale while the peripheral portion is red. It excites considerable irritation. Wheals occur in urticaria (p. 417), certain skin diseases, or may be caused by insect bites, as the mosquito.

Vesicles.—A vesicle is a small blister containing serous fluid. The smaller sizes of vesicles such as are seen in sudamen (sweat rash) are described as miliary sudamina; occurs also in herpes (p. 416) and many skin diseases. The larger vesicles such as are seen in herpes zoster (p. 416) are termed phlyctenular.

Pustules.—A pustule is a small blister containing pus.

Bullae (*blebs*).—A bulla is a large blister, and may contain serum or pus.

Scales.—A scale is a dry exfoliation from the upper layers of the skin. The shedding of scales is known as *desquamation*. There are three varieties, i.e. *farinaceous* when the scales are very fine; *furfuraceous* when they are branny; *membranaceous* when they are very large. Desquamation occurs after scarlet fever (p. 332), measles (p. 333), and in many skin diseases.

Crusts or Scabs are masses of dried exudation, either serum, blood, or pus. Occurring on the lips they are termed *sordes*.

Fissures, chaps, or hacks are cracks in the skin or mucous membrane. They are apt to occur in cold weather when the elasticity of the skin is lost. A fissure may also result from unduly stretching the part, such as a fissure in the anus resulting from constipation.

Excoriations or Abrasions (p. 519) result from the loss of part of the thickness of the epidermis. The raw surface exudes a serous fluid which dries into crusts or scabs. No scar results.

Ulcers or Sores involve the true skin and sometimes the deeper tissues; when they heal a scar remains. They follow suppuration or necrosis of tissue (p. 518).

Scars (*cicatrices*) consist of fibrous tissue covered by epithelium. The true skin, hair follicles, and glands are absent. Scars are red or livid when recent, but become white later.

Cyst.—A bladder, or sac, containing liquid secretion or morbid matter or embryos.

Brawny or Indurated Conditions.—Extensive local indurations which are hard to the touch are spoken of as brawny; they are frequently due to cellulitis (p. 569), or to exudations due to inflammatory processes. They may gradually become softer and disappear, or suppuration may occur (p. 837).

Hyperaemia or Congestion may be active or passive. Active hyperaemia may be due to vasomotor relaxation, or it may be the early stage of inflammation (p. 568). The skin is bright red in colour; pressure on the skin causes local pallor; the colour returns very quickly when pressure is removed. In passive hyperaemia the circulation is abnormally slow, and the skin is livid. Pressure on the skin causes local pallor, the colour returning slowly when pressure is removed.

Oedema.—Oedema is a swelling due to an accumulation of fluid lymph in the cellular tissues. Oedema of the subcutaneous tissues gives a puffy, colourless swelling which 'pits' on pressure—that is to say, the skin is readily indented on maintaining steady pressure with the finger over an underlying bony part. The skin assumes a waxy hue, and when considerable oedema is present it has a stretched shiny appearance. Oedema may be due to general causes or to local conditions.

Local oedema may be found in the neighbourhood of inflammatory foci, such as cellulitis (p. 569). Interference with the normal circulation of the part, which may be caused by thrombosis, pressure from tumours, tight bandages or appliances which constrict the limb, will produce local oedema; or it may develop after extensive operations in which a considerable amount of tissue has been removed or the blood vessels have been tied, such as the oedema of the arm which occurs after extensive amputation of the breast (p. 488).

Solid oedema.—Solid oedema is a condition in which the tissues are so distended as to feel almost solid. Pitting is only obtained after prolonged and forcible pressure. It is found in myxoedema (p. 296), elephantiasis (p. 229), etc.

Dropsy.—Dropsy is a term used to indicate oedema caused either by general or systemic diseases, or local oedema of serous membranes due to congestion. It is an excessive accumulation of lymph in the serous cavities, connective tissues, or lymph spaces. It may be caused by an alteration in the blood itself, allowing abnormal exudation, as in diseases of the blood—anaemia (p. 283), arsenic, lead, and septic poisoning; or it may be caused by interference with the normal circulation generally, as in diseases of the heart (p. 265), kidneys (p. 238), lungs (p. 251), liver (p. 232), etc.; or result from inflammation of some organ due to disease of that organ, as in meningitis (p. 374), pericarditis (p. 274), salpingitis (p. 683), etc. Dropsy is, therefore, a symptom occurring as a result of some disease. Cutaneous dropsy is called *anasarca* (p. 239); abdominal dropsy, *ascites* (p. 268); when occurring in the pericardium, *hydropericardium* (p. 275); in the pleura, *hydrothorax* (p. 264); inside the brain, *hydrocephalus* (p. 380); in the scrotum, *hydrocele* (p. 494); in the Fallopian tubes, *hydrosalpinx* (p. 671); in the eye, *buphthalmos* (p. 642). Treatment of the local condition is given under the respective diseases in which it occurs.

Treatment of General Dropsy.—The cause, cardiac, renal, etc., is treated. The medicinal treatment in general is purgative and diuretic. Hot-air baths (p. 112), hot packs (p. 110), diaphoretics and diuretics (p. 760) are ordered. The diet is light and nourishing; fluids are restricted; a saltless diet (p. 794) may be ordered. Tapping (p. 88), aspirating (p. 87), or puncturing (p. 86) may be necessary for the withdrawal of the fluid according to its situation. The amount of fluid taken by the patient and the quantity of urine passed should be measured daily. When the dropsy is marked the nursing of these cases is arduous and difficult. Great care is needed in the prevention of bedsores (p. 17) or any abrasion of the skin. The legs must be watched carefully for ulcers, etc. The patient should be washed all over every day and carefully dried (p. 11). The clothing should be warm; a wool and cotton mixture is to be preferred. If patients suffering from dropsy are taking drugs with a cumulative property (p. 759), it must be borne in mind that with a sudden withdrawal of fluid, as in tapping, symptoms of overdosing of the drug may become apparent. This may occur with digitalis (p. 773). Cardiac dropsy, see p. 268.

Cutaneous Emphysema is a condition in which air is present in the cellular tissues. The skin will pit on pressure, but the indentation disappears as soon as the pressure is removed. On pressure a crackling noise is heard over the area (*crepitus*).

Hypertrophy of the Skin and Cellular Tissues is an enlargement of the skin and underlying tissues, seen in elephantiasis (p. 229).

Atrophy is a wasting of the part; the tissues become thin, shrunken, withered, and useless.

The General Condition of the Body.—Note the general condition of the body, whether plump or emaciated, deformed or abnormal in any way. Note should also be made as to whether there is loss of power in any limb or muscles.

Weight.—If possible the patient should be weighed once a week or oftener. The same clothing should be worn, preferably one garment only. Infants are weighed without any clothing, a piece of flannel being placed on the scales (see table of weight, p. 855),

3. **Temperature.**—The normal temperature of the body is 98·6° F., but may vary in either direction to the extent of half a degree or more under perfectly healthy conditions, and is usually a fraction of a degree higher in the evening. The temperature in health is elevated as a result of exercise, food, and excitement. It is lowered during sleep, digestion, after sweating, cold bathing, or from the effects of starvation or exposure to cold. In infants the temperature is normally 1–1½ degrees higher than in the adult.

The temperature may be taken in the following places: the mouth, the axilla, the groin, the rectum. The temperature when taken in the mouth is usually half a degree higher than when taken in the axilla or groin, and when taken in the rectum it is about half a degree higher than when taken in the mouth.

To take the Temperature.—*Mouth.*—After cleansing and wiping, place the bulb of the thermometer under the tongue and see that the lips are kept firmly closed.

Axilla.—First dry the axilla, then place the bulb of the thermometer in the axilla and keep the arm flexed over the chest.

Groin.—Dry the groin, then place the bulb of the thermometer in the fold of the groin and flex or cross the leg.

Rectum.—Lubricate the bulb of the thermometer with oil or vaseline and introduce into the rectum for about 2 inches.

In all restless cases and small children the thermometer should be held in position by the nurse wherever the temperature is being taken. After use, shake down the thermometer, cleanse it, and place it in an antiseptic solution such as carbolic (1–20). It should be rinsed in cold water and dried before use. Rectal thermometers must be kept separate; a good plan is to use those made with a coloured glass bulb for this purpose.

Skin.—The temperature of the skin is taken with a specially constructed thermometer. The sensitive bulb is coiled so as to form a disc which is applied to the skin, and the reading is noted

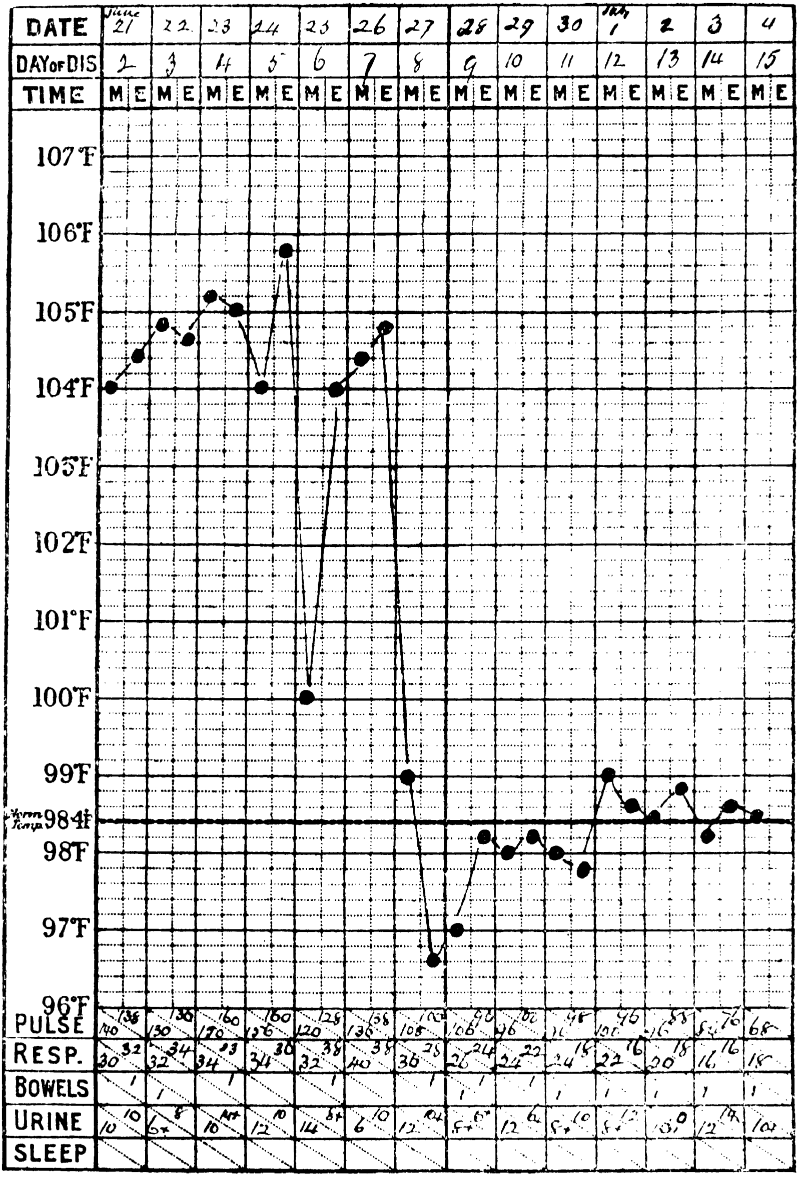


FIG. 158. Chart showing a pseudo-crisis and crisis.

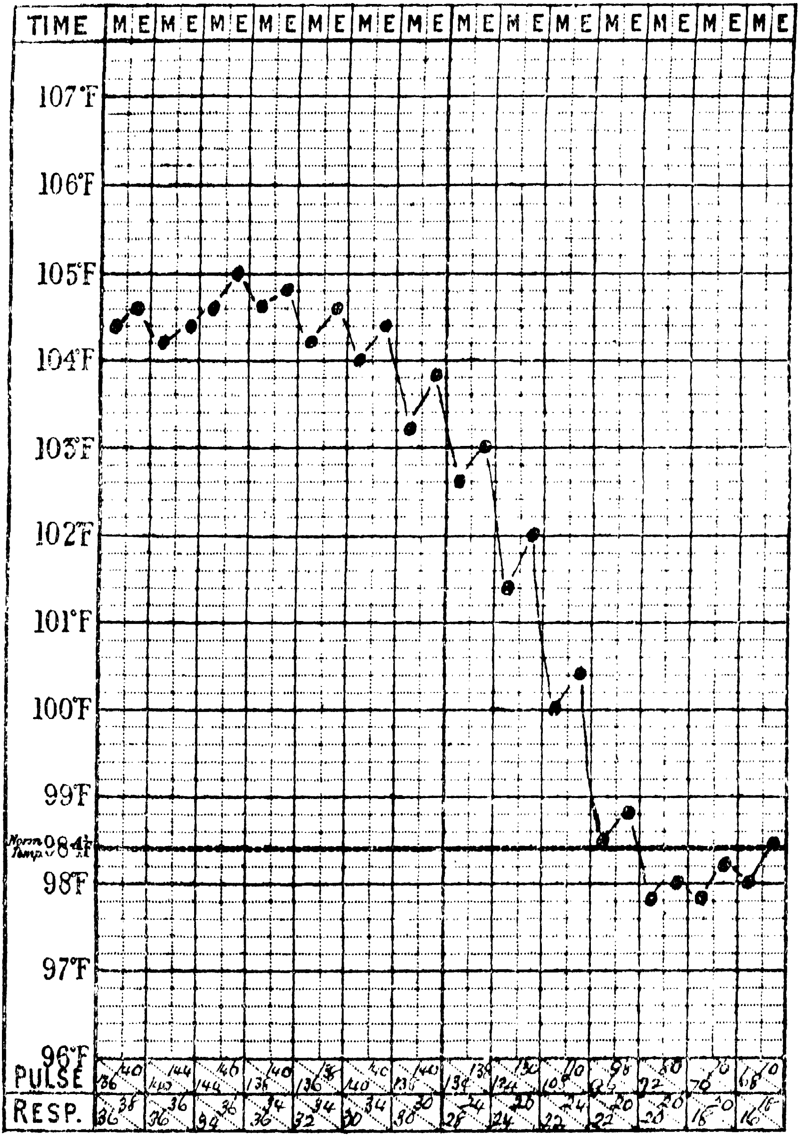


Fig. 159. Chart showing termination of pyrexia by lysis.

on the upright stem. The temperature of the skin is required in some cases of paralysis and brain disease.

Degrees of Temperature are described as follows: Normal, 98°–99° F.; subnormal, 97°–98° F.; collapse, 95°–97° F.; sub-febrile, 99°–100° F.; moderate pyrexia, 100°–103° F.; pyrexia, 103°–105° F.; hyperpyrexia, 106°–112° F.

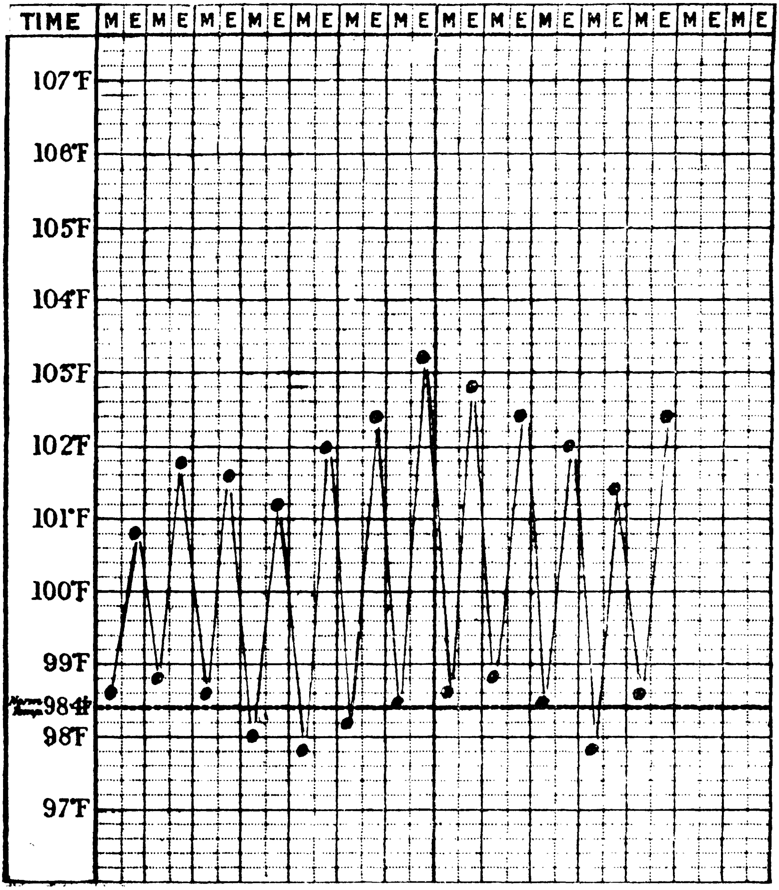


FIG. 160. Intermittent type of pyrexia.

Thermometry.—*Comparison of Fahrenheit and Centigrade thermometers* (for table see Appendix).—1. To convert a Fahrenheit reading into Centigrade: Subtract 32 from the given degree, then multiply by $\frac{5}{9}$. Example: 212° F.$-32=180\times5=900\div9=100$° C. 2. To change a Centigrade reading into Fahrenheit: Multiply the given degree by $\frac{9}{5}$ and add 32. Example: 100° C.$\times9=900\div5=180+32=212$° F.

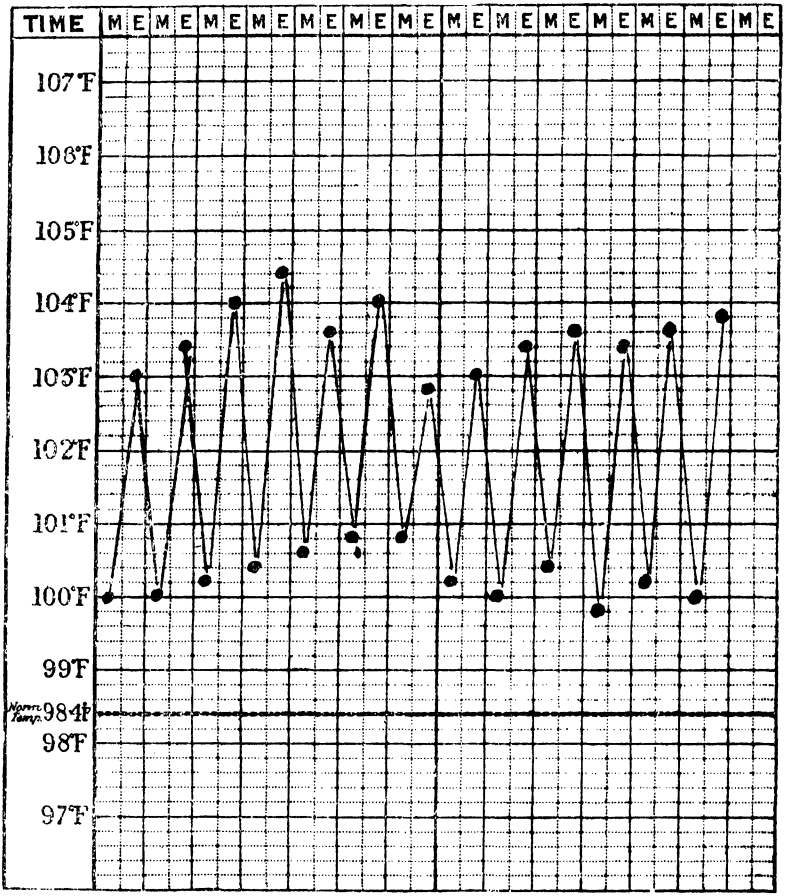


FIG. 161. Remittent type of pyrexia.

The termination of Pyrexia (Fever) may occur by crisis or by lysis. As a rule illnesses with an acute onset terminate by crisis, others terminate by lysis.

Crisis.—Crisis, or acute *defervescence* (p. 199), consists in a fall of temperature to normal, or below, in comparatively few hours (about 4–48), accompanied by a decrease in pulse and respiration rate, sweating (*diaphoresis*), passage of an increased quantity of urine (*diuresis*), and an improvement in the general condition of the patient (Fig. 158).

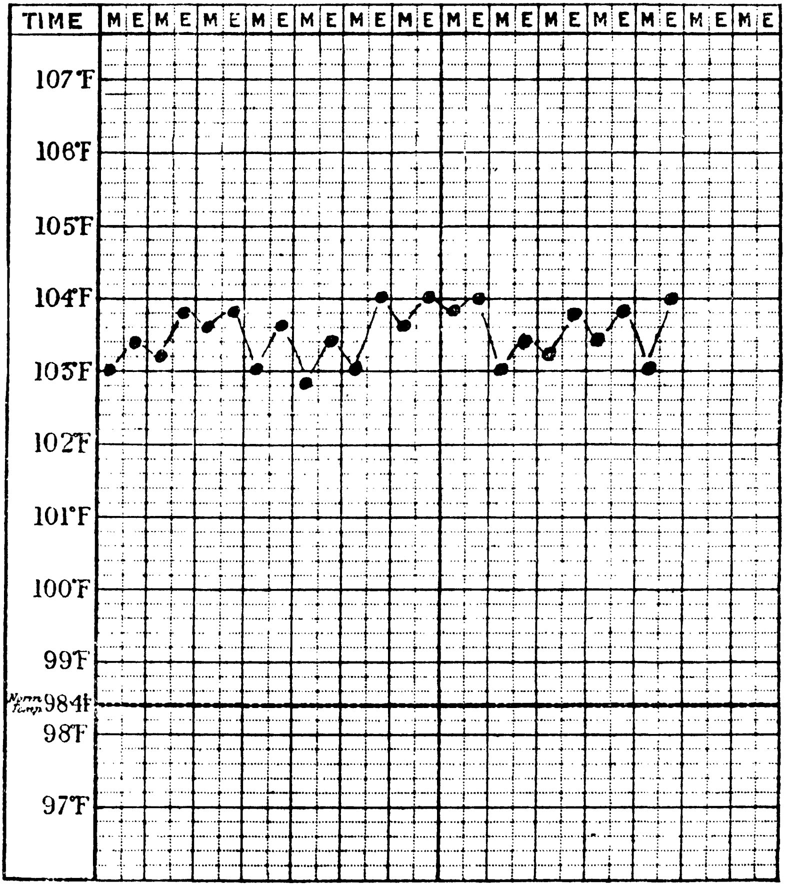


FIG. 162. Continuous type of pyrexia.

Pseudo-crisis is a temporary fall, and when it occurs, is seen a day or two before the true crisis (Fig. 158).

Lysis.—In lysis, or gradual *defervescence*, the temperature falls gradually in the course of three or four days or more, with a corresponding improvement in the patient's general condition (Fig. 159). A sudden rapid fall of temperature with an increased pulse and respiration rate is a symptom of grave import.

Reduction of Temperature may be brought about by the administration of drugs (antipyretics, p. 765); by means of baths and the application of cold (see Chapter II); by cold or tepid sponging (p. 111). The temperature may be raised by the application of heat, hot-water bottles (p. 29), hot-air baths (p. 112), hyperthermia (p. 113), hot baths (p. 116), cardiac stimulants, small doses of

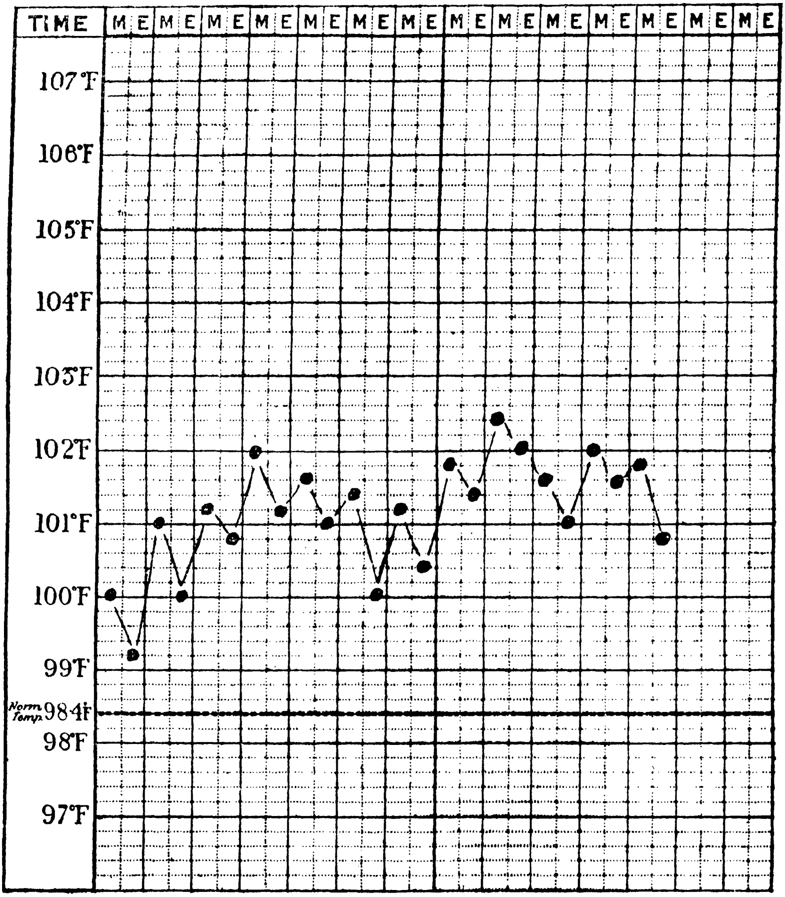


FIG. 163. Inverse type of pyrexia.

alcohol, stimulating enemata (p. 60), and hot saline per rectum (p. 58).

Varieties of Pyrexia.—(*a*) **Intermittent Pyrexia** is characterized by a febrile temperature during one portion, and by a subfebrile or subnormal temperature during another portion of the 24 hours (Fig. 160). The elevation is usually in the latter part of the day, so that the disturbance of temperature may be regarded as an exaggeration of the normal daily fluctuation. The range of the temperature is commonly two or three degrees, but may be much wider.

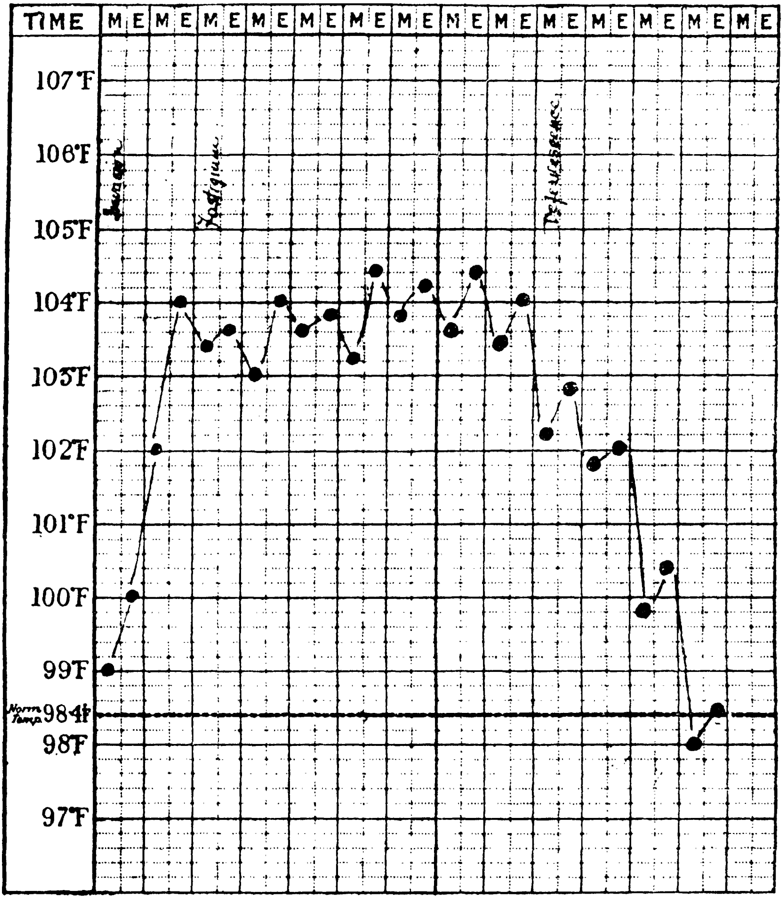


FIG. 164. Chart showing the period of invasion, fastigium, and defervescence.

(*b*) **Remittent Pyrexia** is a pyrexia with well-marked daily fluctuations, the minimum temperature being higher than normal, so that the patient is never actually free from fever (Fig. 161).

(*c*) In **Continuous Pyrexia** the temperature remains at the same elevation with little variation between the morning and evening temperature (Fig. 162).

(*d*) With **Inverse Pyrexia** the morning record is habitually higher than the evening (Fig. 163).

(*e*) **Hectic Fever** is a term sometimes applied to a prolonged condition of intermittent pyrexia (p. 199).

Diseases accompanied by a characteristic rise in temperature are roughly classed together as fevers. *Invasion* is the period during which the temperature rises; *fastigium*, the period in which, though there may be remissions, the temperature remains high; *defervescence*, the period during which the temperature falls to normal (Fig. 164).

Pulse.—The pulse is taken by placing two fingers steadily over the artery for not less than half a minute, preferably one minute. The body should be at rest at the time, and the arm, if the radial pulse is being estimated, recumbent. An excitable patient should have his attention diverted and the examination should be made for a longer time.

The following points must be noted: (i), the frequency; (ii), the regularity (*a*) of force and (*b*) of rhythm; (iii), the quality, viz. (*a*) the volume, (*b*) the tension; (iv), the condition of the artery. In a normal adult pulse, the artery should feel soft, round, and elastic; the blood stream should fill it with moderate force; and the beat should be perceptible under moderate pressure of the fingers. The number of beats may vary from 60 to 80, 72 being about the average. The faster, the smaller, and the softer the pulse, the greater the cardiac weakness, and consequently the more dangerous the condition of the patient; irregular pulse beat being of specially serious import.

(i) **The Frequency.**—The frequency of the pulse varies with age, sex, and idiosyncrasy. In a new-born baby the rate is 120–140 per minute; under eight years, between 90 and 100; from eight to fourteen years, between 80 and 90. In old age the pulse is usually slower than in adult life (see pulse table, p. 856). A woman's pulse-rate is slightly higher than that of a man. Persons may be met with in whom, in an otherwise normal condition of health, the pulse-rate is abnormally quick or abnormally slow. In health the pulse is accelerated by exercise, excitement, emotion, eating, the upright position, alcohol, drugs which stimulate the heart. It is slower during repose and sleep, and in consequence of fatigue, exposure, or fasting. Drugs which quieten and strengthen the heart reduce the pulse-rate, i.e. digitalis, aconite.

Description of pulse-rate (adult).—Slow or infrequent, below 58; normal, 60–80; quick or frequent, 100–120; rapid, 120–150; running, over 150.

(ii) **Regularity.**—When each successive beat of the pulse is of equal value the pulse is said to be regular.

(*a*) *Force.*—The force of the pulse depends mainly on the energy of the heart's action. The force of each beat should be equal. In all conditions of increased activity the force of the pulse is increased, whilst in debility of the heart it is diminished.

(*b*) *Rhythm.*—The rhythm should be quite regular, that is to say, the pause between each beat should be equal, and each beat should take the same time.

Description of Irregular Pulse.—(1) *Intermittent.*—This consists in the missing of a beat either at regular or irregular intervals or occasionally. Other varieties are: the ***pulsus bigeminus***, in which the beats come in couples; the ***pulsus trigeminus***, with the beats in groups of three; the ***pulsus paradoxus***, in which the pulse is almost, or entirely, lost with inspiration and reappears with expiration.

(2) *Irregular.*—The intervals between the beats are uneven, and some of the beats are feebler than others. The pulse ***rate*** may also be irregular, being slow, then fast, then slow again, and is of serious import. A pulse may be irregular and intermittent at the same time.

(3) *Auricular fibrillation* occurs when owing to prolonged strain, as in advanced mitral disease (p. 270), the auricles lose their power of contracting in co-ordination, resulting in a wildly irregular pulse, many beats being imperceptible at the radial artery. The pulse therefore needs to be taken by counting the heart beats, over the precordium.

(4) *Dicrotic.*—The pulse is said to be dicrotic when two beats are felt in the artery to each beat of the heart, the second beat being smaller than the first. The primary beat follows the systolic contraction of the ventricle; the secondary beat follows the closing of the aortic valves, and is a transmission of the impulse given to the blood stream by the contractions of the walls of the aorta, an impulse which under normal conditions, although present, is imperceptible to the finger. When the dicrotic beat is strong, it may be mistaken for a second true beat; when there is any doubt, the heart-beats should be counted at the same time that the pulse is taken. A dicrotic pulse occurs when the arteries are in a relaxed condition.

(iii) **The Quality.**—(*a*) **The Volume.**—The term volume is used to indicate the fullness of the pulse.

In a ***full pulse*** the volume is greater than normal.

In a ***full and bounding pulse*** the volume is increased, as is the frequency of the beats.

In a *small pulse* the volume is less than normal.

In a *thready pulse* the volume is so diminished as to render the pulse almost imperceptible.

(*b*) The Tension.—This is estimated by the force required to compress the artery so as to obliterate the pulse. Three fingers are placed on the artery so that pulsations can be felt in each; pressure is then gradually applied with the finger nearest the heart; the pulsations felt by the other two fingers will gradually diminish, until, as the pressure is increased, the beat can be felt no longer. The tension is gauged by the amount of pressure so required. Considerable experience is required to estimate this accurately. A low-tension pulse is easily obliterated, whilst with a high-tension pulse considerable pressure is required. Another characteristic of the *hypertensive* pulse is that the artery is full between the beats and can be felt under the fingers like a whipcord. With a *hypotensive* pulse, the outline of the artery is almost, if not quite, lost between the beats. A pulse of high-tension has a smaller pulse-wave than a pulse of low-tension. In the latter type each pulsation may seem a strong one, but it is very brief and immediately collapses. A hypertensive pulse is described as a *hard*, or *resistant*, pulse, the condition (described as of 'high arterial tension,' since the arteries are tightly distended with blood) occurs in kidney disease (p. 241). A hard pulse of very small volume is termed *wiry*. A hypotensive pulse is described as *soft*, or *compressible*. The tension of a pulse may be low, while the volume is large, and vice versa.

Corrigan's Pulse, also called water-hammer, splashing, collapsing, and pulse of unfilled arteries. This pulse is suddenly filled but collapses between the beats. It occurs in aortic incompetence (p. 271).

(iv) **Condition of the Artery.**—Normally the artery should feel soft and elastic to the touch. In advanced age and in certain diseases changes occur in the coats of the artery which make them hard, sometimes very hard. This condition is known as 'atheroma' or 'sclerosis' (p. 277). Care must be taken not to mistake a high-tension pulse for one of this kind; the two conditions may co-exist. After a little practice the feel of the two is found to be quite different. The age of the patient is also a guide, and in atheroma the artery, in addition to being hard, will be found to be tortuous.

Sphygmomanometer.—This is a special instrument for estimating the blood pressure. There are several varieties. The instrument is valued as a more accurate means of gauging the blood pressure than by merely 'feeling' the pulse with the finger. The instrument in general use at the present day consists of three parts: a scale marked in millimetres, with a mercury column in an upright glass tube called the manometer; a wide pneumatic cuff; an air pump consisting of a rubber bulb. A second bulb acting as a reservoir may be used to equalize the air pressure. The pieces are connected by rubber tubing, so that when the air is introduced by the pump it is at the same pressure in every part of the apparatus. The cuff is secured round the patient's upper arm and inflated until the pressure obliterates the pulse at the wrist; at the same time the column of mercury is raised by the air pressure, and the amount of pressure necessary to obliterate the pulse at the wrist can be read in millimetres on the manometer. When taking the blood pressure the fingers must be kept on the radial pulse; directly the pulse becomes imperceptible the reading is taken on the manometer; this gives the systolic arterial pressure. Whilst the air is being pumped into the apparatus, the indicator of the manometer is seen to oscillate. The oscillations gradually increase in their range, reach a maximum, and then gradually become restricted again as the pressure in the apparatus increases. The pressure noted at the stage when these oscillations were at their maximum is known as the diastolic arterial pressure. Normal blood pressure varies greatly and may range from 80 to 100 millimetres for the *diastolic*, and from 90 to 130 millimetres for the *systolic* pressure. Average for patients 20 to 50 years of age between 120 and 140; under 20 from 115 to 120; over 50, add 100 to the age of the patient.

The **Sphygmograph** is an instrument for recording graphically the different variations of the pulse. It consists of a metal plate which is placed over the pulsating artery and retained in place by a strap round the wrist. Attached to this plate is a needle delicately adjusted in such a manner that the pulsations of the artery are transmitted to the needle and traced on a prepared carbon paper as a delicate white line. The instrument is worked by clockwork which is wound up before the instrument is applied to the wrist. The traceries or charts are known as sphygmograms, and present a perfect record of the pulse-wave.

Hyperpiesis or High Blood Pressure.—*Symptoms.*—When high blood pressure is associated with arteriosclerosis (p. 277), the arteries are thick and tortuous, arterial tension is high and the pulse volume fairly full. In this type cramping pains in the muscles are common and acute pain in the precordial area may be present and be mistaken for angina pectoris (p. 275).

When the condition is not associated with arteriosclerosis the symptoms include frontal headache, made worse on stooping or on exertion, fullness and throbbing of the veins in the neck, with palpitation and some dyspnoea on exertion. Giddiness, nausea and vomiting, flatulence, indigestion, and constipation are common. Nervous depression is often a distressing symptom: visual symptoms, such as seeing black spots before the eyes, are common. There is a tendency to haemorrhages, retinal haemorrhage, epistaxis (p. 668), haematemesis (p. 563), cerebral haemorrhage (p. 377), and in women menorrhagia (p. 687).

The danger of high blood pressure, especially when associated with arteriosclerosis is of hypertensive heart, a condition in which the heart is enlarged owing to overwork in maintaining the circulation and in failing to compensate (decompensation) (p. 270) for the general circulatory disability. The diastolic pressure as well as the systolic pressure is raised. Hypertensive heart also predisposes to cerebral haemorrhage (p. 377) and cerebral thrombosis (p. 378).

Treatment.—Rest and dieting are the chief requirements in aiming to reduce the blood pressure. The patient may have complete rest in bed until the blood pressure becomes stabilized. Another aim in the treatment is to maintain the body fluids at a reasonably low level, the intake of fluids is restricted to two or three pints daily. In cases of the hypertensive type, the lowering of the body fluids is even more important and rectal saline, either of common salt or magnesium sulphate (25 per cent) solution, is employed. This treatment may be prescribed daily or twice a week.

Diet.—The caloric value is reduced as it is advisable for these patients to be under normal weight. Red meat is only taken once a week, fish, chicken, and eggs, with large quantities of fresh fruit and vegetable are given. Stimulants and stimulating drinks (tea and coffee) are strictly limited or forbidden.

In all cases the patient is advised to lead a quiet uneventful life, avoiding fatigue or exertion, retiring early and rising late, with rest at definite intervals during the day and having one whole day in bed each week.

Hypopiesis or Subnormal Blood Pressure is present in conditions of shock and haemorrhage, chronic wasting, myxoedema, and Addison's disease.

Symptoms.—Patients suffering from low blood pressure are usually anaemic and feel the cold very much, the pulse is soft and of low volume, they are weak and avoid exertion; attacks of fainting and giddiness may occur. A systolic pressure below 110 is considered abnormally low.

Respiration.—The normal rate of respiration in the adult is 14–18 per minute. The ratio between respiration and pulse is commonly 1–4. In health respiration may be quickened by exertion, excitement, emotion, and by sudden chilling of the body as in cold bathing. It is slower during repose, sleep, and from the effects of fatigue. Respirations may be counted by observing the rise and fall of the chest, or by placing the hand lightly on the chest; the latter is not always reliable, as the patient is less likely to breathe naturally. The most accurate way is to take the respiration during sleep (see p. 590). The rate of respiration is increased in disease of the lungs and air passages (p. 248); in feverish conditions due to toxins, such as infectious fevers, etc. (p. 330); in organic disease affecting the circulation (p. 265); in disorders in which the composition of the blood is altered; in haemorrhage (p. 563); and by drugs which stimulate the respiratory centres (p. 768). It is decreased in certain diseases of the brain, e.g. coma (p. 360), compression (p. 546), and by drugs which depress the respiratory centres, such as opium (p. 774).

Description of Respiration.—*Shallow*, when the volume of inspired air is less than usual.

Deep, when the volume of air is greater than usual.

Shallow respiration may be either slow or rapid, but it is more often rapid. Deep respiration is slow, and is characteristic of many diseases of the brain (p. 374).

In *abdominal breathing* the diaphragm and abdominal muscles are chiefly used; this is usual in men and children.

Thoracic breathing is the term denoting that the chest muscles are principally used; women usually breathe in this manner.

Dyspnoea means difficult breathing, and is applied to breathing when the act is accompanied by conscious effort.

Orthopnoea is a condition of extreme dyspnoea in which the patient is unable to breathe unless upright.

Stertorous breathing is accompanied by a loud snoring noise during inspiration, which is called stertor. It occurs in cases of brain disease (p. 378).

Stridulous breathing is breathing accompanied by a harsh, grating sound during inspiration, called stridor. It occurs in cases of laryngitis (p. 669), croup (p. 603), and obstruction in the air passages.

Wheezing is a sound which may accompany either inspiration or expiration; occurs in bronchitis (p. 248).

Grunting occurs at the end of expiration in some diseases of the lungs, such as pneumonia (p. 251) and pleurisy (p. 262).

Crowing occurs during inspiration in cases of croup (p. 603).

Sighing and yawning are often significant symptoms in illness. Sighing occurring in cases of haemorrhage (p. 563) indicates that the body is not receiving sufficient oxygen. Yawning is a symptom of syncope or faintness and also occurs in cases of shock, collapse, etc. (p. 563). Yawning occurring in a case of convalescence after a severe illness usually denotes a return of strength.

'Air hunger' is characterized by dyspnoea (p. 205) on both inspiration and expiration, the patient is both gasping for breath

and sighing; it occurs in diabetic coma—acetonepnoea—(p. 292), and may also be present in severe haemorrhage (p. 563).

Cheyne-Stokes respiration or tidal breathing.—The respiration begins quietly, each succeeding respiration being a little louder and deeper than the preceding, and continues increasing in intensity until a climax is reached. The respirations at this stage are strong, noisy, and distressing, but then gradually subside. This wave of respiration is then followed by a complete pause for several seconds (period of *apnoea*), after which the same process is repeated. The pupil may contract during the stage of apnoea and dilate during the stage of dyspnoea: it has been noticed to change its size with each powerful respiration. The pulse may vary with each period of the cycle, or may remain perfectly uniform. Cheyne-Stokes respiration is met with under many different circumstances, including diseases of the brain and membranes (p. 374), of the heart and great blood vessels (p. 277), of the lungs and kidneys; also in connection with acute fevers (p. 332), sunstroke (p. 551), morphine poisoning (p. 780), and senility. When it occurs in connection with acute illnesses it is always a sign of grave import, and often of approaching death (p. 207).

Grouped breathing.—This is another variety of tidal breathing in which the respirations are slow and of equal range and occur in groups of two or three. The significance of this form is not so grave as of Cheyne-Stokes breathing and must not be confused with it.

In addition to the rate and character of the respiration, the shape of the chest, the action of the muscles of respiration, and the positions assumed by the patient should be observed.

Disease may alter the character of the breathing so as to rest the parts that are affected; for instance, in abdominal disease the breathing will become thoracic, the abdomen being held rigid; this is termed *restricted abdominal breathing*. When the bases of the lungs are affected the upper part of the chest will do all the work; this causes *diminished expansion* of the chest. In some new-born infants one side of the chest may not have expanded; this is a serious condition and requires artificial respiration to put it right (p. 714). A patient with one side of the chest affected usually lies on the affected side so as to give free movement to the sound side. In prolonged dyspnoea and orthopnoea the *accessory muscles of respiration* are brought into action; these consist of the pectoralis muscles, the sterno-mastoids, the muscles of the alae, of the nostril, which cause the nostrils to be opened widely during inspiration. When the effort of inspiration is very great, the lower end of the sternum is drawn in with each inspiration. These symptoms are of grave import. When respiration fails to give the blood a sufficient supply of oxygen, the lips and extremities become blue (cyanosed) or white (livid asphyxia) (p. 714); cyanosis may also be caused by a failing heart. As the patient becomes extremely weak the sterno-mastoid muscles tend to draw the head slightly backwards, throwing the chin forward and upward with each inspiration, the mouth being drawn down at the same time. This is a sign of rapidly approaching death.

Signs of Approaching Death.—Spasm of the sterno-mastoid muscles mentioned above; coarse, moist tracheal *râles*, known as the death rattle; progressive slowing of respiration; imperceptible pulse; cold sweating (p. 187); cyanosis or pallor; glazing of the cornea; fixed, dilated pupils; convulsive movements; gasping and cold breath. A peculiar sweet sickly smell, resembling that of cows, is often present before death from abdominal disease. Cheyne-Stokes respiration may also be a sign of approaching death (p. 206).

4. **Mouth.**—This includes the teeth, gums, and tongue. Note whether the teeth are false or permanent, firm or loose, sound or decayed, clean or covered with tartar, notched or imperfect, furrowed or laminated.

The *gums*, whether normal, or swollen with a tendency to bleed easily, pale or red; presence of pus around the teeth.

The *tongue*, whether coated, furred in the centre or all over, dry, brown, fissured (p. 189), ulcerated, bright red (beefy), or swollen. Whether tremulous or steady, protruded in a straight line or to one side, or unable to be protruded beyond the teeth.

Breath.—Note the odour of the breath; whether sickly from gastric disturbance, offensive from the presence of decayed teeth, or foetid from disease. Bromides may cause offensive breath (p. 772), and certain drugs and alcohol impart their odour to the breath. In delayed chloroform poisoning (p. 458), also in some cases of diabetes (p. 289), the breath has a sweet smell due to acetone.

5. **Rigors.**—A rigor is an acute paroxysm of shivering, usually the herald of an attack of fever, the height of the fever being proportionate to the severity of the rigor. The shivering is accompanied by a sensation of cold, especially referred to the back; the surface is cold, the teeth chatter, the features are pinched and blue, the pulse is small and rapid. The attack may be so violent as to shake the bed. The temperature at the onset may be subnormal, but rapidly rises to 103° F. or higher even whilst the patient still shivers. The rigor may last from a few minutes to half an hour or more. The cold stage is followed by a period of reaction in which the patient feels intensely hot, the temperature is higher, the pulse full and bounding, the skin hot and dry; thirst, headache, and the usual signs of fever are present. This stage is

followed by one of sweating which may be very profuse, the temperature falls, and the pulse is slower.

Treatment.—Give hot drinks, extra hot blankets, and hot-water bottles during the first stages. When sweating occurs, the blankets are reduced and the patient is dried down with hot towels, and dressed in warm dry garments. The temperature should be taken during the first, second, and third stages. A rigor is always a serious symptom and should be immediately reported.

Shivering.—Shivering may take place without any rise of temperature or sweating, and is thus distinguished from a rigor. It may be caused by excitement, cold, over-fatigue, and fright.

Tremor.—Tremor, or subsultus, is a condition of general trembling, occurs in some cases of great prostration, and at the commencement of some forms of delirium (p. 359), and in several nervous diseases (Chapter IX).

Twitching.—This may occur as the result of drugs such as strychnine (p. 776), or may be due to disease of the muscles or nervous system, as in chorea (p. 389).

Floccilation, or picking at the bedclothes, and *carphology*, grasping at imaginary objects, occur in cases of extreme prostration. They are serious symptoms.

6. **Hiccough, or Singultus.**—Resulting from a chronic spasm (p. 361) of the diaphragm, it is frequently noticed as a temporary condition after eating and drinking. Persistent hiccough is sometimes present in extreme exhaustion following acute or chronic diseases. It is often associated with certain diseases of the brain and toxaemia, or it may result from irritation of the phrenic nerve, or from stomachic, hepatic, intestinal, or peritoneal disease. It is then a serious symptom and most difficult to relieve. It may be due to hysteria.

Cough.—This may occur from irritation of the nose or throat, or from disease arising in any part of the area supplied by the vagus nerve, i.e. larynx, trachea, lungs, oesophagus, or stomach. It is of the utmost importance to note whether a cough is productive of sputum or dry.

Description of coughs.—Those due to disease of the lungs may be deep, shallow, forcible or weak, short or suppressed, dry or moist, constant or paroxysmal. In heart disease (p. 265) the cough may be constant, breathless, and distressing. In thoracic aneurysm (p. 278) a hard brassy cough is present. A barking cough is sometimes present at puberty and is not due to disease of the lungs; a similar cough accompanies some forms of dyspepsia. A nervous one is short, sharp, dry, and frequent. The typical coughs of croup (p. 603), whooping-cough (p. 354), and diseases of the lungs (Chapter VII) will be found under their respective diseases.

7. **Flatulence.**—The accumulations of air or gas (flatus) in the alimentary canal is termed flatulence. *Borborygmus* is the term applied to the noise or rumbling produced by flatus in the intestine.

Distension.—*Tympanites* is the term applied to distension of the abdomen due to an accumulation of gas or air in the intestines or stomach, and is relieved when flatus is passed. Gas may be brought up from the stomach with noisy eructations or quite quietly. Note must be made of this, and, further, whether air is swallowed immediately before the eructation. Carminatives, drugs which assist in the relief of flatulence, are peppermint, cajuput, dill water (see p. 766). The passage of flatus by rectum is assisted by rectal enemata (p. 60), or the passage of a rectal (flatus) tube (p. 61), after the use of which note must be made as to whether flatus is passed and whether the abdominal distension is relieved thereby (p. 502).

8. **Posture.**—The position of the patient should be noted and varies with the condition. The knees are drawn up in abdominal pain; the patient lies flat in fevers and exhausting diseases; the head and shoulders are raised in chest and heart complaints; in severe dyspnoea the patient sits upright and inclined forward, being unable to lie back against the pillows (p. 27); the arms are raised over the head in some heart complaints; the patient may lie on the affected side in some cases of disease in the thorax, or on the face in colic. Slipping off the pillows is a sign of exhaustion. The head is retracted in many brain diseases.

Facial Expression (*facies*).—The expression may evince pain, anxiety, apathy, or other emotions. The face may be pale or flushed or cyanosed; one cheek only may be flushed; pallor around the mouth may exist with a flushed face; the face may have a drawn or pinched expression (p. 514).

Eyes.—These may be sunken (p. 629) or unduly prominent (proptosed, p. 629); the pupils may be dilated, contracted, or unequal, they may or may not respond to light. The eyes may have a fixed staring gaze; a shifty, restless movement; or a wild, excited appearance. There may be tremor of the eyeballs (nystagmus, p. 629). Squint may be present. *Conjugate deviation* of the eyes is the term applied to forcible deflection of both eyes to one side. It is a common symptom in gross lesions of the motor centres or tract in the brain, such as haemorrhage (p. 372) or tumour (p. 380). With an irritative lesion in the brain the eyes are turned towards the convulsed side (away from the lesion); when the lesion is destructive the eyes are turned away from the paralysed side and are described as looking towards the side on which the lesion is situated. In lesions of the pons Varolii, the deviations are exactly reversed. (For the mental symptoms of bodily disease see Chapter X, p. 410.)

9. **Sleep.**—Observe the length of each period of sleep, and the durations of the intervals when the patient is awake; whether it is quiet and restful, or accompanied by talking, moaning, etc., twitching of the muscles or jerking of the tendons. The condition of the patient on waking should also be noted, whether rested and refreshed, or tired and depressed, easily aroused, dazed on waking, etc. (See also insomnia, p. 358.)

Appetite.—The state of the appetite must be noticed, whether the patient is inclined or disinclined to take food, or dislikes it; whether there is difficulty in persuading him to take it or whether meals are taken with avidity. The amount taken must be recorded.

Bulimia is the term applied to an inordinate appetite; large quantities of food are taken but the hunger is not satisfied.

Anorexia is loss of appetite.

Parorexia is a craving for special articles of diet.

Pica is a desire for articles which are not foods, such as coal, paper, hair, etc.

Strength.—This should be observed and is indicated by the ability to stand, walk, sit, or move; and the degree of fatigue which follows bodily or mental exertion.

Asthenia is the term applied to failure of strength, debility.

10. **Restlessness.**—May be present during sleep or waking, and may be of the mind or body, or of both. The time of its occurrence and its duration should be noted; if possible, the cause should be discovered and remedied.

Delirium.—There are two kinds of delirium (p. 359), the low muttering variety and the excited type in which imaginary voices and objects may be heard or seen. If violent in character, the patient is kept in bed with difficulty, he refuses food and drink and may be continually noisy, violent, or may exhibit suicidal or homicidal tendencies. Delirium tremens due to alcoholism is of this character.

Coma.—This varies in degree. The patient may be absolutely unconscious with incontinence of urine and faeces, or may be in a semiconscious condition in which he can be roused and made to understand for a short period but relapses immediately.

The Typhoid State.—A condition of extreme prostration due to toxaemia is known as the typhoid state, and is an indication of the gravest danger to the patient's life. It may develop in many diseases other than true typhoid.

Symptoms.—The patient lies on his back, deaf and indifferent to his surroundings, the eyes may be closed or open; in the latter case the term *coma-vigil* is given. There is a low muttering delirium. The pulse is rapid and shallow. Hyperpyrexia is usual, but the temperature may be subnormal or collapsed (p. 195). The tongue is dry and brown (p. 207), the lips and teeth are covered with sordes. There is incontinence of faeces, with either retention or incontinence of urine. Carphology or floccilation (p. 208) may be present, also jerking of the tendons (subsultus tendinum). In unfavourable cases the stupor deepens and death is preceded by coma or signs of cardiac failure. In favourable cases the toxic symptoms gradually diminish with a slow and gradual improvement in the general condition and, later, a protracted convalescence sets in.

Treatment.—The cause is treated. The patient's strength is maintained by nourishing food, cardiac stimulants, and alcohol when possible. Saline infusion is given in many cases either by rectum (p. 58), subcutaneously (p. 82), or intravenously (p. 74), especially if hyperpyrexia or collapse is present. (For treatment of collapse see p. 562; treatment of hyperpyrexia see p. 198).

Unusual Cries.—May consist of sharp screams as in brain disease (cephalic cry, p. 588), or screams known as 'night screams' occurring in hip disease (p. 615), or cries due to bad dreams, or simply moaning. (For typical cries of infants see Chapter XVIII, p. 582.)

Subjective Symptoms.—1. **Pain.**—Note the character of the pain, whether sharp, dull, piercing, shooting, stabbing, aching, or gnawing, and its position, duration, and intensity. Discomfort may consist in only a slight feeling of malaise or may amount to pain. In describing pain the patient's own words should be used as far as possible.

2. **Nausea.**—A feeling of sickness either preceding vomiting or not connected with it is called nausea. Note whether it is accompanied by retching. Retching is the term applied to the muscular efforts which if continued usually result in vomiting.

3. **Giddiness.**—*Vertigo.*—Note whether the patient describes the giddiness as the room going round, or the room steady and feeling unsteady himself; also the frequency of the attacks, whether the patient actually falls or inclines to one side, and whether vomiting is present at the time of giddiness.

4. **Bad Dreams.**—Note whether the patient calls out and is restless during sleep, and whether the bad dreams occur after eating anything unusual; or may be accounted for by anything that has taken place during the day, such as excitement, fright, etc.

5. **Defects in Sight, Hearing, Taste, Smell, Touch, etc.**—Note whether the defect is continuous or intermittent, and whether it appears to improve for a time then becomes worse again, and anything that appears to have an influence on the condition.

6. **Loss of Sensation and Power.**—See Chapter IX, p. 363.

CHAPTER VI

MEDICAL NURSING

General Treatment and Nursing of Medical Cases.—The following is the usual routine treatment of a medical case. Special points regarding the various diseases will be found under the respective diseases.

Rest in bed.—The position varies according to the nature of the complaint. Careful hygiene of the body (p. 11) is necessary, and, if allowed, a daily bath should be taken. To patients unable to leave their beds a daily blanket bath (p. 11) should be given, but in severe cases where this would be too tiring, the face, trunk, and upper limbs might be washed in the morning, the lower limbs being washed at night.

Diet.—This will vary very considerably, and will be mentioned under each disease; strict attention is necessary, as it forms a very important part of the treatment.

The *temperature, pulse, and respiration* should be taken and charted at regular intervals, generally night and morning, but in acute cases every four hours or oftener. If a four-hour chart is in use, a night and morning chart should also be kept, taking the temperature from the four-hour chart at the same time each day—for instance, 6 a.m. and 6 p.m.; the latter is the more useful chart for diagnostic purposes (see charting, p. 50).

Bowels.—Careful record must be kept of the bowels, i.e. number of stools, consistency, etc. (p. 186); anything abnormal should be reported immediately, and the stool reserved for inspection (p. 30).

Urine.—Measurement of the urine should be the rule in all medical cases for a few days. A specimen of urine should be reserved and tested twice a week (p. 34). In certain cases (mentioned under their proper headings) it may be necessary to test the urine, and to measure the quantity passed daily, for many weeks (urine testing, see p. 34).

Vomit should always be measured and the quantity recorded on the chart. It should be tested with litmus paper for acidity or alkalinity (p. 35).

Medicines form an important part of the treatment; great care must be taken in their administration (p. 759). The nurse should always ascertain the physician's wishes as to giving, or withholding, the drug in the event of untoward symptoms arising from its use (p. 771). No drug should be given by the nurse unless ordered by the physician in attendance, unless in a case of unexpected syncope when a stimulant may be necessary to keep the patient alive until the arrival of the medical man.

An accurate report must be made as to sleep (p. 210); the nurse may employ several means of assisting sleep in a sleepless patient (see p. 358), but on no account may a drug be given unless ordered.

Visitors should be allowed according to the physician's instructions, but if the nurse notices that the patient becomes unduly tired or in any way less well, she should tactfully ask the visitors to leave; there should be no difficulty over this if the nurse sets about it in the right way.

The application of external treatment needs to be carefully and conscientiously carried out.

When the patient is allowed to commence getting up, the nurse should see that the change is instituted very gradually, remembering that the patient will be weak and must not be allowed to become unduly tired. The first day should be on a couch for a short time; this is increased, and the patient then allowed into an arm-chair; then, when able, to begin walking gradually, help being given if necessary. Once the physician has ordered the patient to be up, this should be carried out each day unless there is a definite reason for the patient being kept in bed. Any unfavourable symptom arising should be immediately reported to the physician.

Diseases of the Digestive System

General nursing.—In addition to the nursing just described the following points require special attention. Particular care is required in the cleansing of the mouth and teeth; this should take place regularly three or four times daily in sub-acute cases, and in acute cases before and after food (see the care of the mouth, p. 15). The nurse should realize that great care and gentleness are essential in cleansing the mouth and gums. Rough handling is productive of much harm, especially in diseases of the mouth.

Particular observation should be directed towards the vomit (p. 184), the stools (p. 185), the diet.

The ***temperature and pulse*** are taken twice a day in cases with pyrexia or in those in which a sudden change of temperature is anticipated; during the acute stage the temperature, pulse, and respiration are taken every four hours.

Position.—The patient is kept in the recumbent position unless contra-indicated under the disease. In acute conditions, no exertion on the part of the patient must be permitted, or fatal complications may result.

Diet.—The food is of the utmost importance and varies with each case and according to the wishes of the physician in attendance, so that general lines only are noted under each disease. It is restricted in all stomach and intestinal cases in order to allow the affected part to rest.

Bowels.—It is important to keep the bowels empty in order that toxins are not absorbed. Aperients or enemata (p. 62) may be ordered if necessary. An aperient must on no account be given without the physician's orders, as, in many cases, serious harm may result.

Complications.—The nurse must constantly bear in mind that any of the following grave complications may occur at any time: perforation (p. 513), internal haemorrhage (p. 511), peritonitis (p. 512); she must therefore be able to recognize the symptoms and their gravity, and report to the physician without delay.

Other unfavourable symptoms are: Pain, vomiting, sudden rise or fall in temperature, quick pulse and rapid respiration, haemorrhage, abdominal distension, inability to pass flatus by the rectum (p. 209), diarrhoea, constipation.

DISEASES OF THE MOUTH

Stomatitis is inflammation of the mouth.

Acute Catarrhal Stomatitis is the most common form of stomatitis.

Causes.—It occurs in fevers, in dyspepsia, and as a result of irritation by hot foods, tobacco, spices, etc.

Symptoms.—Redness, swelling, and increased sensitiveness of the mucosa, with increase of mucous secretion. There is discomfort in chewing, but no constitutional disturbance.

Treatment.—Careful cleansing of the mouth before and after food (p. 15) is required. Glycerine and borax, or a mixture of glycerine, carbolic, and boric acid, may be used. The food should be soft, and highly seasoned food should not be taken.

Follicular Stomatitis.—In follicular stomatitis, vesicles appear on the mucous membrane of the mouth. These vesicles rupture and give place to small greyish ulcers with red margins.

Cause.—The disease may occur independently or in conjunction with dyspepsia or one of the acute fevers.

Treatment.—Cleansing of the mouth before and after food (p. 15) is necessary. The ulcers may be touched with alum or nitrate of silver. Soft food should be taken, hot and highly seasoned food should be avoided. Any constitutional disturbance is attended to.

Ulcerative Stomatitis occurs most commonly in delicate children who are subjects of defective feeding and hygiene; it also occurs in epidemic form among adults in camps, jails, etc.; and in mercurialism (p. 384).

Symptoms.—Fever, pain on mastication, salivation, foul breath, and often swelling of the cheeks, lips, and gums. The gums become red, swollen, and ulcerated, and bleed readily. The teeth are loosened, the glands below the jaw become enlarged. The constitutional symptoms may be severe, and death may result. As a rule with appropriate treatment the ulcers heal in a week or two.

Treatment.—The treatment is similar to that given for follicular stomatitis. The patient is kept in bed until the temperature is normal. Liquid demulcent drinks are given in abundance until the ulcers have healed. Chlorate of potassium is given internally. The mouth may be cleansed with hyd. peroxide, permanganate of potash, or glycerine and carbolic or boracic acids.

Gangrenous Stomatitis (Cancrum Oris, Noma).—This disease occurs in debilitated children, a large proportion of the cases occur after measles or one of the other exanthemata (p. 330).

Symptoms.—The tissues of the cheek become indurated and hard, ulceration starts on the buccal aspect, and in severe cases proceeds to perforation. There is great prostration and very little pain. Pyrexia with a rapid pulse is present, diarrhoea is common, and septic or aspiration pneumonia (p. 254) may supervene. These cases are very fatal; death usually occurs within a week.

Treatment.—Feeding, stimulation, and the cleansing of the mouth are the chief points in the nursing. The ulcer may be cauterized or touched with pure carbolic acid.

Parasitic Stomatitis (Thrush) occurs most commonly in infants, but may be present in adults in the last stages of an exhausting illness.

Cause.—Development in the epithelial layer of the mucous membrane of the mouth of a fungus, the Saccharomyces albicans or the Oidium albicans.

Symptoms.—Slightly raised, pearly white patches appear on the tongue, lips, cheeks, and palate. There may be diarrhoea.

Treatment.—Careful cleansing of the mouth with glycerine and boracic and correction of any constitutional disturbance are essential. Strict attention to the cleansing and sterilization of all feeding utensils (p. 591) is of the utmost importance.

Pyorrhoea Alveolaris (Rigg's Disease).—An inflammatory condition of the margins of the gums, accompanied by a purulent discharge from pouches extending along the roots of the teeth.

Symptoms.—In the early stages the gums are swollen and oedematous and bleed easily. The tongue is coated and the breath is exceedingly offensive. The disease may be limited to a few teeth, or involve many, or all. The condition is generally preceded by an excessive deposit of tartar, beneath which bacterial infection occurs. In many cases pus may be squeezed out of the gums on pressure. In mild cases and the later stages the gums shrink and become atrophic.

Treatment.—The teeth are cleaned and the tartar is removed; astringent and antiseptic lotions are applied to the infected tissues. Decayed teeth and stumps are extracted as soon as the mouth is rendered less septic. All the teeth may require extraction or the gums only may be treated. Vaccine treatment is given. An aperient is prescribed, and the bowels are kept active. Soft nourishing food is necessary and the patient's general condition is improved as far as possible. A mouth wash must be used frequently, and always before and after every meal.

Complications.—Infection of the air passages, aspiration pneumonia (p. 254); anaemia (p. 283); multiple neuritis (p. 365); chronic osteitis; rheumatoid arthritis (p. 311); lardaceous disease (p. 581).

Parotitis.—Acute septic parotitis, inflammation of the salivary glands.

Cause.—Occurs in connection with enteric (p. 341), pneumonia (p. 251), empyema (p. 264), pyaemia (p. 577), and other infections; it may also result from injury, disease, or operations on the abdominal organs (p. 511).

Symptoms.—Pain, swelling, moderate pyrexia.

Treatment.—Mouth washes, fomentations (p. 90), and if suppuration occurs, incision.

Diet.—These patients require to be fed up; nourishing liquid diet is given, and stimulants may be ordered.

Particular care is needed in the cleansing of the mouth. The mouth should be thoroughly cleansed with the prescribed solution every 2 hours at least, and before and after every meal.

Diseases of the Oesophagus

Oesophagitis, or inflammation of the oesophagus, may result from swallowing boiling liquids, acids, alkalis, or from wounds. It also occurs in small-pox (p. 334).

Symptoms.—Pain on swallowing. Tenderness over the gullet and pain referred to the sternum are the chief symptoms.

Treatment.—The diet should be soft or liquid; in severe cases, rectal feeding (p. 57) may be necessary.

Obstruction of the Oesophagus.—Obstruction of the oesophagus may be due to foreign bodies, muscular spasm, stricture, malignant growth; or result from pressure from without by an aneurysm (p. 278) or mediastinal tumour.

Treatment.—The treatment consists in removal of the foreign body, or in gradual dilatation of the stricture with oesophageal bougies (p. 64). If this method fails, or is impracticable, gastrostomy (p. 506) is performed. Given diet should be liquid or soft solids if able to be swallowed. In severe cases rectal feeding (p. 57) may be required until the lumen of the oesophagus is increased, or gastrostomy has been performed.

DISEASES OF THE STOMACH

Gastrorrhagia is haemorrhage from the stomach. Haematemesis is the term which is applied to blood which is vomited.

Haematemesis.—*Cause.*—Haematemesis may be due to rupture of dilated veins, ulcer, cancer, cirrhosis of the liver (p. 233), certain fevers (e.g. small-pox and yellow fever), phosphorus poisoning (p. 775), haemophilia (p. 286), purpura (p. 286), etc. It may follow injuries, operations, or the swallowing of corrosive fluids; it may also vicariously replace menstruation.

Symptoms.—In a few cases death may take place before vomiting occurs. In others, the symptoms of haemorrhage are present (p. 563). The blood brought up is either dark red or brown resembling coffee grounds; it may or may not be mixed with food; it is non-frothy and often acid. Melaena (p. 564) commonly follows the attack.

Treatment.—Absolute rest in bed in the recumbent position is essential. The patient is kept flat and not allowed to turn. The knees are flexed over a bolster. The patient must not be allowed to turn or move about in bed until the physician gives permission. An ice-bag (p. 92) may be ordered for the abdomen, and an injection of morphia is generally prescribed. The mouth should be cleansed every two hours or oftener.

Diet.—Rectal feeding (p. 57) is given and continued for some days after all haemorrhage has ceased; food is then started by mouth and varies according to the causative disease. Small quantities of 1 ounce are given to commence with and are gradually increased until the patient is taking 5 ounces every two hours. Solid food is begun with soft solids in small quantities, then gradually increased, all indigestible foods being strictly forbidden.

In the most recent treatment, food is allowed from the onset (see diet, p. 220).

Acute Gastric Catarrh.—*Causes.*—The causes are unsuitable food, over-eating, unripe or over-ripe fruit, a chill.

Symptoms.—The symptoms include those commonly known as a 'bilious attack.' Headache, discomfort or pain in the region of the stomach, loss of appetite, furred tongue, bad taste in the mouth, and frequently nausea and vomiting. In severe cases pyrexia is present. The vomit may contain food at first, then be bright yellow (bilious). Constipation is usually present, but in a few cases diarrhoea occurs, especially in children.

Treatment.—Rest in bed is advocated. Calomel followed by a saline purge is commonly prescribed, and if there is much vomiting bismuth may be ordered. In adults, large quantities of water containing soda bicarbonate are given, which produce vomiting and so wash out the stomach. Hot fomentations (p. 90) or a mustard leaf (p. 94) may be applied to relieve pain.

Diet.—This should consist of water only, or milk diluted with barley water, lime water, or weak tea, Marmite for the first two days or until all nausea and vomiting have ceased, the diet is then gradually increased, only plain food being given. The attack usually passes off in three to five days.

Toxic Gastritis.—A condition caused by swallowing corrosive or irritant poisons.

Symptoms.—The symptoms are intense pain, tenderness, vomiting, with shock, which is often fatal.

Treatment.—The treatment consists in the administration of the antidote (p. 770), relief of pain by hypodermic injections of morphia or other drugs, treatment for shock (p. 561).

Chronic Gastritis.—*Dyspepsia.*—*Cause.*—It may follow an acute attack, habitual over-eating, excessive use of alcohol, tea, iced drinks, irregularity of meals, imperfect mastication, general debility, anxiety, etc., or accompany cancer, or ulcer of the stomach, or heart or liver diseases.

Symptoms.—The symptoms are slight epigastric tenderness, pain in the stomach most severe an hour or two after meals, and pain at the back of the chest. The appetite is variable, the tongue furred, and there is a bad taste in the mouth. Nausea and vomiting are frequent, especially in the morning. The vomit contains food in various stages of digestion with mucus, or it may consist entirely of mucus. The stomach may be distended with gas, and gaseous eructations may be troublesome. The bowels are constipated or irregular. Headache, giddiness, and low spirits are prominent symptoms.

Treatment.—All improper habits must be given up, such as over-eating, over-drinking, imperfect mastication, etc.

Diet.—The diet must be much restricted for a time. Tea, coffee, and alcohol should be replaced by cocoa and milk. Pork, green vegetables, pastries, and fatty and highly seasoned dishes are not allowed. The patient should begin with milk foods, then gradually the diet may be increased by the addition of boiled or steamed white fish, boiled chicken, the lean of mutton or beef, small quantities of mashed potato, oatmeal porridge, pea-soup, etc.

The bowels must be opened daily; if necessary an aperient is given, either a saline, cascara, or calomel. A mixture will probably be ordered to be taken either before or after feed. Bismuth is prescribed for the relief of pain and sickness. Soda-mint may be given for the relief of flatulence and heartburn. In severe cases the stomach may be treated by daily washing out (lavage, see p. 64). The teeth must have careful attention, all those decayed must be extracted and replaced later by an artificial set if necessary.

Gastric Ulcer.—Gastric ulcer is a simple or peptic ulcer, occurring on the interior wall of the stomach.

Cause.—Irregular and unsuitable food, anaemia, Rigg's disease (p. 216), pressure on the epigastrium, and injury are exciting causes, but the precise mechanism of the production of an ulcer is not understood. The ulcer may be of the acute or chronic type. Ulcers, if small, may heal completely, leaving small scars; large ones in cicatrizing may cause obstruction if near the pylorus, or, if in the middle of the stomach, hour-glass stomach may result. If the ulcer extends deeply, perforation may take place, either into the peritoneum causing peritonitis (p. 512), or into the posterior sac of the peritoneum giving rise to a subphrenic abscess or a subphrenic pyopneumothorax (p. 264), etc., or it may perforate into the intestine.

Symptoms.—The symptoms may be very slight or absent, or there may be some pain after food with occasional vomiting. When the symptoms are marked, there is pain, tenderness, vomiting, and haematemesis (p. 217). Pain is severe and constant. It is aggravated by taking food, and is not lessened until the food has left the stomach either by vomiting or by being passed into the duodenum. The pain is complained of in the middle of the epigastrium, and may extend through the body to the back or around the left side. Frequently symptoms are absent for considerable periods. Vomiting occurs commonly after taking food and consists of partly digested food. Haematemesis (p. 217) occurs in many cases, and may be of a small or large quantity. The blood is red if abundant, but often it is scanty and resembles coffee grounds. The bowels are constipated (p. 186), the stools may be tarry from the presence of altered blood (melaena). There is frequently no pyrexia. Pallor is common, even in the absence of haemorrhage. The tongue is clean or slightly coated.

Fatal haemorrhage (p. 217) may set in without previous symptoms. Perforation is indicated by severe abdominal pain and shock. The features are pinched, the patient lies on the back, the pulse is rapid and small, and the abdomen distended (see perforation, p. 513).

Treatment.—Treatment consists in absolute rest in bed for three or four weeks. The patient is kept flat, allowing the head to be moderately raised, the knees are flexed over a bolster (Fig. 6). For the first two or three weeks the patient must not be allowed to help himself in any way. After the first fortnight, if the physician gives permission, the patient is allowed to turn on either side but not to sit up. Later, he is allowed to be propped up in bed. When allowed to get up this must be done very carefully and gradually, and for some time after convalescence the patient should rest the greater part of the 24 hours.

In the newer treatment of the condition food by mouth is given from the commencement and is according to modification of Professor Meulengracht's treatment (see diets, p. 791). An immediate blood count and blood grouping is made. Daily tests are also carried out for haemoglobin and blood urea. The blood pressure is estimated daily. Iron is given three times a day, no alkali is given unless pain is severe. Aperients are not allowed, an enema is given between the fifth and tenth days.

Immediate blood transfusion is given whenever:

(1) Pulse rate exceeds 140 (p. 201)
(2) Systolic pressure falls below 70 mm. (p. 203)
(3) Blood urea rises above 100 mg. per 100 c.c.
(4) Haemoglobin falls below 40 per cent

Perforation is treated by immediate operation (p. 505). Cases with recurrent haematemesis are also treated surgically.

Complications.—The complications are haematemesis (p. 217). perforation (p. 513), anaemia (p. 283), hour-glass stomach, or stricture of the pylorus (p. 219). Hour-glass stomach and stricture of the pylorus are treated surgically.

Dilatation of the Stomach.—Chronic dilatation is either obstructive, i.e. due to cicatrization near the pyloric orifice of an ulcer causing stenosis, cancer, congenital hypertrophy, kinking of the duodenum, etc., or atonic, i.e. due to chronic inflammation, overloading of the organ, gaseous distension, or loss of muscular tone due to debilitating diseases. (For acute dilatation see p. 515.)

Symptoms.—Pallor, thirst, weakness, emaciation, and mental depression. The urine is scanty, the skin dry, the bowels constipated. Discomfort about the stomach and other dyspeptic symptoms are present. The method of vomiting is characteristic, i.e. once in several days a large quantity (several pints) of vomit is brought up. The vomit is frothy and smells like stale beer.

Treatment.—For non-obstructive dilatation, rest and regulation of diet are essential, fluids are restricted. The stomach is washed out once before commencing treatment (p. 65). Strychnine is usually ordered. An abdominal belt may be of great assistance. In obstructive dilatation, daily lavage is given (p. 65).

Diet.—Food is given in small quantities and frequently, and should be chiefly nitrogenous. Starches, fats, and liquids are restricted. Toast should be substituted for bread. Rectal saline injections (p. 58) are given to prevent thirst. Later, an operation may be undertaken to secure further relief.

DISEASES OF THE INTESTINES

Diarrhoea.—This symptom may be due to several causes. The stools are looser than normal and are passed frequently.

Causes.—The causes are nervousness, stimulation of the bowel by certain foods and drugs, a chill, various diseases, constipation, bad food, irritants, etc. It also commonly accompanies typhoid fever, enteritis, etc.

Treatment.—The treatment consists in removal of the cause. When due to indigestible food, a dose of castor oil and subsequent restriction to milk foods, the milk having been boiled previously, will suffice. When due to a chill, rest in bed is advisable, with the application of warmth to the abdomen and the extremities, and carefully regulated diet of glucose and water, albumin water, boiled milk, arrow-root. Stimulants are sometimes required. Drugs may be prescribed, lead and opium, bismuth and opium, etc. In severe cases a starch and opium enema (p. 60) may be ordered.

Constipation.—Constipation is a condition in which the faeces are retained in the intestine for an abnormally long time. They become hard and drier than normal.

Causes.—Deficiency of food or liquid, deficiency of intestinal secretion, or deficiency of action of the intestinal muscle. Local causes may be disease of the intestine, tumours or growths pressing on the intestine, weakness of the abdominal muscles. Among general causes are sedentary habits, errors of diet, diseases of the nervous system, etc., and bad habits.

Symptoms.—The symptoms are varied, but headache, mental depression, and furred tongue are common.

Treatment.—Regulation of the habits.

The *diet* should consist of bulky foods (see roughage, p. 787) such as porridge, greens, plenty of fruit, either raw or stewed, and plenty of fat. Fluids should be drunk freely, a large glass of hot or cold water the first thing in the morning and last thing at night is of great assistance. Exercise should be taken regularly. In severe cases it may be necessary to empty the bowel by a dose of castor oil followed by a large soap-and-water enema (p. 62). It may be necessary to remove hard impacted faeces (scybala) from the rectum with the finger or the handle of a spoon or a scoop. Aperients may be required to overcome the condition at first, but these should not be continued indefinitely. Senna pods, cascara, or aloin may be taken at night, or a saline draught in the morning. As the condition improves the aperients should be diminished, then discontinued. Extra fruit, vegetables, and water should then be taken in their place. The treatment of constipation occurring as a result of general disease is that required for the causative condition.

Haemorrhage from the Intestine (Enterorrhagia).—This condition is generally secondary to some other disease, either of the stomach, intestine, or rectum; or to general conditions such as purpura (p. 286), etc., or to injury.

If due to haemorrhoids (p. 279), the blood will be red and may either be slight or profuse in amount; if due to disease higher in the alimentary canal, it may be dark red or tarry in appearance (melaena).

Treatment.—The treatment consists in complete rest in bed, unless the symptoms are slight or due to haemorrhoids, and in treating the cause.

Intestinal Colic.—Intestinal colic is a painful spasm of the bowel.

Causes.—The causes are constipation, flatulence, irritation of the intestine by some indigestible substance, lead poisoning, dysentery, strangulation of bowel, etc.

Treatment.—The treatment consists in the application of warmth to the abdomen. The bowels should be opened, by an enema (p. 60) preferably, since aperients may increase the pain and aggravate the symptoms. If the cause is known to be indigestible food, a dose of castor oil may be given. The diet should be restricted to milk or milk and water until the cause has been determined.

Food should be given hot. Hot baths (p. 116) and opiates may be necessary if the pain is very severe and causing collapse (p. 562).

Ulcerative Colitis, or Ulceration of the Colon.—*Symptoms.*—The symptoms are diarrhoea, pain or tenderness in the abdomen. The breath may be offensive, but the appetite may be good. The stools are offensive, and may contain mucus, and sometimes blood and sloughs (p. 185). Moderate pyrexia is usually present.

Treatment.—The treatment consists in careful dieting and complete rest in bed. Drugs are given by the mouth and may include bismuth, opium, lead, and mercury. Drugs may also be injected into the rectum to act on the diseased mucous membrane of the colon. These enemata are given slowly by siphonage, and the patient is directed to retain them (p. 58). Lavage may also be ordered daily to cleanse the bowel (p. 61). In severe cases, appendicostomy (p. 509) may be performed, and the bowel is washed out and treated through the artificial opening.

Diet.—The diet varies but should be liquid at first and of such a nature as to leave little residue, e.g. albumin water, chicken broth, jelly, etc. Later, it is increased to soft solids, and finally to solids.

Mucous Colitis.—Consists in discharge from the rectum of membranous-looking casts of the bowel.

Causes.—The causes are constipation, secretory neurosis of the intestine, chronic appendicitis (p. 231), adhesions, etc.

Symptoms.—The symptoms are paroxysms of pain, local tenderness, and constipation, passage of mucous casts from the bowel. There is no pyrexia as a rule.

Treatment.—The treatment consists in the cure of the constipation by suitable diet, consisting of porridge, fruit, vegetables, brown bread, nuts, etc., which should be taken in large quantities. Irrigation and medication of the bowel may be ordered to be administered by enemata. In severe and obstinate cases appendicostomy (p. 509) or other operations may be performed.

Sprue.—Is a chronic disease of warm climates. The cause is not known.

Symptoms.—The symptoms are flatulent dyspepsia, profuse liquid clayey stools. The mucous membrane of the mouth becomes red, eroded, and extremely sensitive. Salivation is present and may be very painful. Emaciation and weakness are common, but temporary improvement may take place from time to time. Death may follow from exhaustion. In mild cases the general health is not much impaired.

Treatment.—The treatment consists in rest in bed and dieting.

The *diet* should be of milk for four to six weeks, the milk being sipped in small quantities at a time. After a time the dietary is cautiously extended to milk foods. Rectal wash-outs (p. 61) may be ordered. Change of climate is necessary, and tropical climates should be avoided.

Perforating Ulcer of the Duodenum.—The symptoms and treatment are mainly those described under gastric ulcer (p. 219); pain after food usually corresponding to the time the food leaves the stomach and enters the duodenum.

Catarrhal Enteritis, or Inflammation of the Mucous Membrane of the Bowel.—The causes are: unsuitable diet such as tainted milk, unripe or over-ripe fruit, violent purgatives, irritant poisons.

Symptoms.—The symptoms are diarrhoea (p. 186), griping pains, rumbling noises (borborygmi), and vomiting. The stools vary in consistency and colour, but are often pale and watery and may be offensive. Thirst and anorexia are common symptoms. There is slight pyrexia in some cases, but frequently this is absent.

Treatment.—The treatment is by rest in bed, warmth, and milk diet (see treatment for diarrhoea, p. 221).

Dysentery.—An inflammation of the large intestine, probably infectious in origin, and characterized by pain, rectal tenesmus (see Glossary), and the frequent passage of small amounts of mucus and blood. The true cause of dysentery is not known in all cases; but the Amoeba coli is the cause of amoebic dysentery. Carriers (p. 317) occur in both types of dysentery and may be the cause of an epidemic.

Symptoms.—The symptoms are diarrhoea and colic. The stools are very frequent and may consist solely of mucus and blood. Abdominal tenderness with colicky pains and tenesmus are present. There may be moderate fever or the temperature may be subnormal. The pulse is rapid and feeble, there is great thirst and extreme weakness. Death may occur after a few days from exhaustion.

Treatment.—Rest in bed in the recumbent position is essential. Warmth is applied to the extremities.

Diet.—The diet is liquid and given in small quantities at a time, e.g. barley water, albumin water, rice water, chicken tea, arrow-root; later, semi-solid milky foods, then light solid diet. Stimulants may be necessary if there is much collapse (p. 562). The drugs prescribed may be morphia, bismuth, ipecacuanha, astringents, and Epsom salts. Suppositories (p. 63) of cocaine, morphia, or belladonna may be ordered for the relief of tenesmus.

Local treatment.—Fomentations (p. 90) or an ice-bag (p. 92) may be ordered to the abdomen. Saline infusion may be given either by rectum (p. 58), subcutaneously (p. 82), or intravenously (p. 74). After recovery a flannel belt should be worn.

Amoebic Dysentery.—Amoebic dysentery is colitis caused by the Amoeba dysenteriae.

Symptoms.—The disease may be acute, sub-acute, or chronic. In chronic cases the onset is gradual. The patient passes a few loose stools daily with a little pain; the stools contain some mucus and blood. Under treatment the attack passes off. In more acute cases, the symptoms are more severe and the attacks more frequent.

Treatment.—The treatment should include rest in bed during an attack.

Drugs.—The drugs prescribed include ipecacuanha and morphia, castor oil, sodium sulphate, and intestinal antiseptics such as sulphanilamide (p. 776), sulphaguanidine (p. 839). Rectal irrigation (p. 61) with quinine, permanganate of potash, or silver nitrate may be ordered. Emetine is given subcutaneously.

Diet.—The diet is liquid or semi-liquid.

In obstinate cases appendicostomy (p. 509) may be performed.

Parasites.—Internal.—Diseases caused by Cestodes (Tapeworms).—*Varieties.*—Taenia solium; Taenia saginata; Dibothriocephalus latus; Hymenolepis nana; Taenia echinococcus. These worms have two states—the larval state, which is found in one species of animal, and the adult state, occurring in another species, such as man.

Taenia Solium and Taenia Saginata.—Two common varieties known to affect man are the Taenia solium (pork tapeworm) and the Taenia saginata (cattle tapeworm, Fig. 165). The worm in the adult state consists of a head, a narrow neck, and a number of segments amounting to five or six hundred or more. The head is about the size of a pin's head, it is armed with suckers and a double row of hooklets, whereby it attaches itself to the intestine, either the duodenum or upper jejunum, the remainder lying loose in the intestine. Each segment contains male and female elements, and as it becomes mature it is cast off; the mature segments are larger than the others. The segments nearest the head are narrow, those at the tail being broadest. Each mature segment contains many thousand eggs. The worm has the appearance of jointed tape and may be 10 feet long. If the cast-off segments are swallowed by a pig or by cattle (the intermediary hosts) the shells of the ova are dissolved and the embryos escape. They bore into the alimentary canal and settle in muscles and other organs, where they develop into larvae or cysticerci, also called measles or bladder worms (larval state). Pork or beef affected in this way is called measly. This bladder worm becomes mature in about four months; the head then protrudes from the cyst. If measly pork or beef, insufficiently cooked, is eaten by man, the head attaches itself to the mucous membrane of the intestine and a tapeworm with segments is developed.

Symptoms.—The symptoms are abdominal discomfort, irritation of the anus, segments passed in the stools.

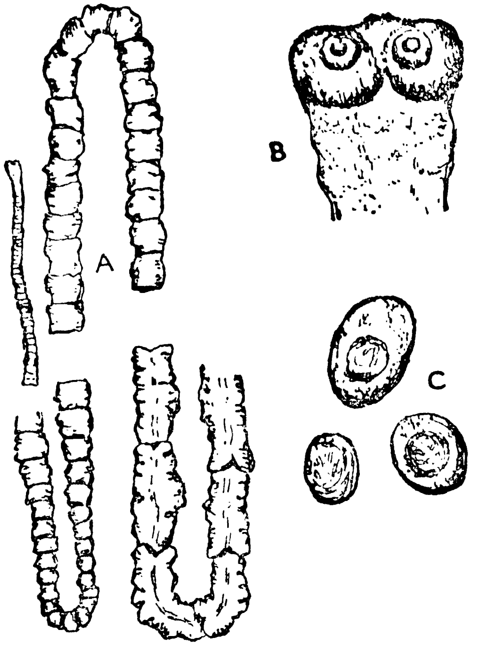


FIG. 165. Tapeworm (*Taenia saginata*)
A. Natural size. B. Head, much enlarged.
C. Ova, much enlarged.

Treatment.—After a fast of 16–18 hours, a dose of liquid extract of male fern is given, followed in 2 hours' time by a purgative. The evacuations must be examined to see if the head of the worm has been expelled, as, if not, the worm will grow again and the symptoms reappear in the course of a few months. If the head has not come away, the treatment is repeated in the course of a few days. Either the larval or the adult stage of the worm may occur in man, but most commonly it is the adult type to which man is host.

Dibothriocephalus Latus (Broad Tapeworm).—The larval form of this parasite is found in certain freshwater fish. Man is infected by eating uncooked fish. The mature worm is of a yellowish-brown colour, and is from 2 to 10 yards in length. The head is flat and without hooklets; the segments are usually broader than long.

Hymenolepis Nana (Dwarf Tapeworm).—This parasite develops without any intermediate host. Man is infected probably through food contaminated with eggs derived from the faeces of infected rats or human beings. The adult worm is only a few millimetres long. The head is small and provided with a single circle of hooklets. Great numbers are usually present.

Cysticercus Cellulosae.—When the ripe ova of Taenia solium are accidentally swallowed by man he becomes the host for the larval form of the parasite, a much more serious matter than being the host for the adult type. The result and symptoms depend upon the number of the ova swallowed, and in which organs they locate. Symptoms may be slight or death may result. In the muscles they cause soreness and pain; in the eye, disturbance of vision and possibly blindness; in the brain, various nervous manifestations, all due to pressure and irritation by their growth.

Echinococcus Disease.—If a cysticercus of the Taenia echinococcus (the tapeworm which inhabits the intestine of a dog) is formed in the human body, a *hydatid cyst* results. Hydatids may attack any part of the body, but are more common in the viscera. They may increase in size and number and may be very small or weigh from 10 to 20 lb., or the parasite may die and the cyst shrivel and disappear. Surgical treatment is given if possible.

Diseases caused by Nematoda or Roundworms (Ascaris Lumbricoides).—This worm lives chiefly in the small intestine, but may wander into the large intestine or the stomach. From the stomach it may reach the mouth, nose, or larynx. It is about 10 inches in length, and resembles an earthworm in appearance (Fig. 166), but is a dirty white in colour. There is a male and female worm; no intermediary host is required for their development. The eggs reach the small intestine of the host through drinking contaminated water.

Symptoms.—Picking the nose, grinding the teeth, abnormal appetite, emaciation, are the chief manifestations.

Treatment.—Santonin powder is given at night, with either milk, sugar, or bread and butter. A laxative is given the following morning. The santonin is repeated every alternate night until four doses have been given.

Threadworm (Oxyuris Vermicularis).—Lives chiefly in the large intestine and appendix, and is most commonly found in children.

Symptoms.—Those of roundworm. The worms resemble small pieces of white thread (Fig. 167), and may be present in large numbers in the stools.

Treatment.—An aperient is given. An infusion of quassia or strong salt solution (see enemata, p. 62) is injected into the rectum every alternate night for a week or ten days. Santonin may be given to destroy the worms that are high up. A mercurial ointment is used to allay the irritation of the anus.

Trichina Spiralis.—Trichina occurs in both the larval and adult form in man and the lower animals. Infection occurs from eating improperly cooked pork which contains the cysts and causes trichiniasis when developed in man. The larvae are set free and develop into adults in the intestine, where they discharge embryos. Some embryos die or escape with the faeces, whilst others penetrate the intestinal wall, and are carried to the muscles, where they become encysted.

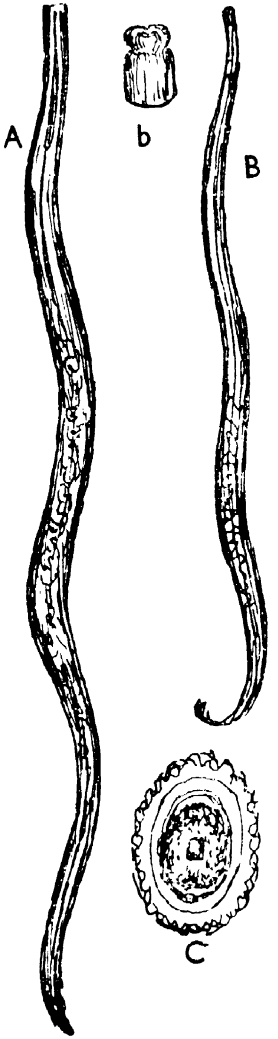


FIG. 166. Roundworm (*Ascaris lumbricoides*)

A. Female. B. Male. C. Egg

(*b*) The enlarged head end with its three lips

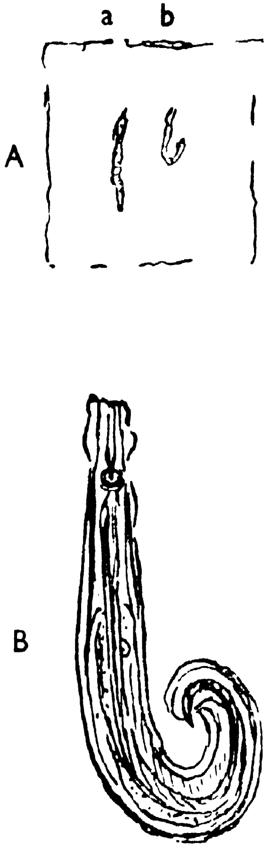


FIG. 167. Threadworm (*Oxyuris vermicularis*)

A. Natural size (very slightly magnified).

(*a*) Male; (*b*) female

B. Magnified.

Symptoms.—When the migration begins, symptoms of intestinal irritation, with fever, vomiting, and perhaps collapse, occur, and later severe pain in the muscles resembling rheumatism. The gravity of the condition depends upon the number of parasites developed and their location.

Hookworm (Ankylostoma Duodenale).—This is a small worm about half an inch in length which develops in the small intestine. It has a hook-like head by which it attaches itself to the intestine. It causes an intense persistent anaemia. Recovery is not possible until the worm has been expelled.

Treatment by thymol and purgatives is recommended.

Filaria Sanguinis Hominis.—This parasite is a small worm which develops in the lymphatics. Infection occurs through the bite of a mosquito, in whose body occurs one cycle in its life history. It is a disease of tropical climates. The embryos may be found in the blood of the affected persons only at night during sleep, unless the person works at night and sleeps in the day. They eventually block the lymph channels, producing conditions known as *haematochyluria*, *elephantiasis*, and *lymphy scrotum*. Chyle and blood are passed in the urine (p. 236).

Elephantiasis.—A chronic affection of the cutaneous and subcutaneous tissues, due to obstruction of lymph-vessels, and characterized by enormous thickening of the affected parts. The disease occurs in successive attacks accompanied by fever and by swelling of the affected parts (p. 191), usually the lower extremities and genital organs: it is endemic (p. 330) in certain tropical countries, and seems to be connected, in many cases, with the presence in the blood of Filaris sanguinis hominis.

Intestinal Obstruction.—Acute intestinal obstruction may be due to any of the following conditions: (1) Impaction of faeces, gall stones, or foreign bodies; (2) intussusception; (3) volvulus or twist; (4) stricture, resulting from cicatrization of ulcers, injury, new growths, or following an operation; (5) strangulation, due to either a hernia or a loop of bowel being fastened down by adhesions; (6) compression or traction, caused either by pressure from a tumour or adhesions.

Intussusception is a condition in which a portion of the bowel slips into the part immediately below. The intussusception consists of three layers—the inner or entering layer, the middle or returning layer, and the outer or receiving layer. The tumour produced may vary in size from an inch to a foot or more. The part involved may be the small or large intestine, the most common situation being the ileo-caecal valve. It may be caused by constipation, growths, and other abnormal conditions of the intestine, or may arise spontaneously.

Symptoms of **Acute Intestinal Obstruction.**—Acute pain in the abdomen, vomiting, constipation. The pain sets in suddenly without apparent reason. The vomit is at first bilious; later it becomes dark brown and faecal. Constipation may be absolute from the first so that not even flatus is passed, or in milder cases the rectum may be emptied early in the course of the condition. In intussusception, blood and mucus are commonly passed per rectum. The abdomen becomes distended unless the obstruction is high up. The skin is cold and moist, the temperature subnormal, the pulse small and rapid, the tongue dry, thirst and scantiness of urine are present. The features are pinched. The symptoms of peritonitis set in rapidly unless relief is obtained.

Treatment.—Purgatives must be avoided. Hot fomentations (p. 90) or an ice-bag (p. 92) may be applied over the abdomen. If the vomiting is severe, the stomach is washed out once or twice a day (p. 64). Nothing is given by mouth in the acute cases except a small quantity of water; saline may be given by the rectum (p. 58). In cases of intussusception large enemata are given (p. 60), or air is introduced into the rectum to endeavour to reduce the intussusception. Operative treatment is undertaken for the relief of the obstruction in all acute cases except those due to strangulated hernia (p. 510) or intussusception which have been reduced by treatment. Opiates may be ordered if the pain is severe.

The symptoms of **Chronic Obstruction** develop slowly. Constipation is usually the most marked symptom. Diarrhoea may be present, or may alternate with constipation. Pain is slight and intermittent at first. Headache, depression, and languor are usual. The tongue is coated and the breath is offensive. There may be some elevation of temperature or it may be normal. Acute symptoms may supervene at any time.

Treatment.—The treatment is that given under constipation (p. 221). In these cases abdominal massage (p. 751) and electricity are often beneficial.

Enteroptosis.—Enteroptosis is a displacement downwards of the abdominal viscera.

Causes.—The causes are weak abdominal muscles, the result of pregnancy, or wasting conditions. In certain individuals the build of the body tends towards the condition.

Symptoms.—The symptoms consist of a vague abdominal pain and neurasthenic symptoms (p. 394) generally. Special symptoms may arise indicating that one or more organs, e.g. the stomach, colon, or the kidney, are particularly affected.

Treatment.—A mechanical support should be obtained for the abdomen, i.e. a specially made belt or corset which elevates the displaced organs. Digestive and nervous symptoms are treated. Food is important; the patient should be fed up as much as possible. During the time that the abdominal belt or corset is being made, the patient should remain in bed in the recumbent posture with the foot of the bed raised on blocks. Massage (p. 751) to strengthen the abdominal muscles is beneficial.

Appendicitis, or Inflammation of the Appendix.—*Causes.*—The predisposing causes are catarrh, which may be due to constipation or over-eating, foreign bodies, faecal concretions, or tuberculosis. In many cases no cause can be discovered.

Symptoms.—The onset is sudden and commences with pain in the abdomen generally, which, in the course of a few hours, becomes more severe in the region of the appendix, tenderness is marked, and there may be local swelling. There is moderate pyrexia and the pulse-rate is increased. (See chart, Fig. 13.) Constipation, vomiting, and sometimes difficulty in micturition may be noted.

Different varieties or degrees of the disease occur:

(*a*) *Mild cases* with typical symptoms already described.

(*b*) *Appendicitis with abscess formation.*—This starts with the same symptoms, but in spite of rest and treatment the tenderness persists, the swelling increases, and the temperature and pulse do not become normal. There may be a rigor (p. 207), with increase of temperature. Local oedema (p. 190), redness, and fluctuation may be present.

(*c*) *Acute perforating*, or gangrenous appendicitis, begins with acute abdominal pain, great tenderness, and repeated vomiting. The signs of collapse (p. 562) and peritonitis (p. 512) quickly appear, and death may take place within 48 hours unless immediate operation (p. 505) is resorted to.

(*d*) *Relapsing appendicitis.*—This form consists of repeated attacks of the first type, which may terminate in an abscess or gangrene.

(*e*) *Chronic appendicitis.*—In this type there may be few symptoms to indicate the source of the disease, but the general health is poor and indefinite abdominal symptoms are frequent.

Treatment.—The simple cases must rest in bed in the recumbent position. The knees should be flexed over a bolster (Fig. 6) and an abdominal cradle may be used if there is severe pain.

The *diet* is restricted to milk diet until the temperature and pulse are normal and all acute symptoms have subsided. The bowels are opened every other day by a simple enema (p. 62). Local treatment consists in fomentations (p. 90) or an ice-bag (p. 92). Opiates are not prescribed as a rule, as they mask the symptoms.

If under this treatment, within a period of two to four days, the symptoms do not subside, operative treatment is resorted to (p. 499). When an abscess forms it is opened and the appendix is removed at the same time or some time later. In doubtful cases operation is the only safe treatment. In acute suppurative cases operation is the only hope; recovery depends on the promptness of action. In relapsing cases appendicectomy (p. 509) is performed during an interval between the attacks. Many doctors advise an operation after the first attack, however slight.

DISEASES OF THE LIVER

Jaundice (Icterus).—Means a staining of the skin and mucous membranes by the bile pigment. Three distinct types occur.

Causes.

(1) *Obstructive,* e.g.:

(*a*) By gall stones.

(*b*) By inflammation of walls of gut, cancer.

(*c*) By pressure in ducts from outside.

(2) *Toxic,* in blood poisoning, poisoning by arsenic, alcohol, benzene, phosphorus, which causes damage to liver cells.

(3) *Haemolytic,* due to excessive destruction of blood cells.

Symptoms.—The skin and conjunctiva are yellow. In severe and chronic forms the skin may be dark green (black jaundice). Bile is present in the urine (p. 236) which is dark brown or green in colour; the colour varies according to the amount of bile present. Bile is also present in the perspiration and stains the linen. The stools are white, pasty, or clay-like, offensive in odour owing to the absence of bile and resulting failure of fat digestion. Constipation is usual but diarrhoea may be present. There may be dyspepsia and a bitter taste in the mouth, with distaste for food; fat is not well digested. There is a feeling of drowsiness and languor. Severe itching of the skin, or even urticaria (p. 417), is common. The pulse is slow in acute catarrhal cases. There is usually irritability in temper, and in severe cases of either type there may be grave cerebral symptoms, delirium, muscular tremors (p. 361), coma (p. 360), convulsions (p. 588), a dry tongue, and the symptoms of the typhoid state (p. 210).

Treatment.—The treatment is directed to the cause. The patient is usually kept in bed for a short time. Diet is restricted to liquid or light solid food. A mercurial purge followed by a saline draught is usually ordered. Hot baths (p. 116) may be given to relieve itching. Tonics may be ordered.

Cholemia.—The term cholemia has been applied to a group of symptoms which arises in severe forms of jaundice. It occurs usually after the age of 40, and the predisposing causes are syphilis (p. 322), cirrhosis of the liver, alcoholism.

Symptoms.—The first symptoms are those already given, and later there is a headache, delirium, tremor, convulsions, coma, and a dry tongue. The temperature is febrile at first, later subnormal. The pulse is rapid and weak. Vomiting is frequent, the vomit may contain red blood, or partly digested blood, i.e. coffee-ground vomit (p. 184).

Treatment.—Purgatives are given at first, calcium lactate to prevent haemorrhage, and intestinal antiseptics.

Diet.—Milk diet with plenty of water to drink. Injections of saline solution, or soda bicarbonate, may be ordered either subcutaneously (p. 82), intravenously (p. 74), or by rectum (p. 58). Rectal feeding (p. 60) is prescribed when vomiting is severe.

Cirrhosis of the Liver.—This term is applied to a condition in which there is an overgrowth of the interstitial tissue with destruction of the hepatic cells (hepatitis).

Causes.—Chronic alcoholism is the most common cause, but is not invariably so. It may follow acute fevers.

Symptoms.—In the alcoholic type the patient has the appearance of a drinker, the tongue is furred, the appetite poor, and morning sickness is present; the bowels are usually constipated. Haematemesis (p. 217), epistaxis (p. 668), or melaena (p. 222) may occur. Jaundice is usually slight and late in onset. The urine is concentrated. Ascites (p. 191) and oedema of the feet are common. The temperature is sub-febrile (p. 195). Toxic symptoms, such as drowsiness, coma, convulsions, delirium, are of grave import. In the non-alcoholic type, jaundice is early and persistent and the urine contains bile (choluria). The abdomen is prominent, due to enlargement of the spleen and liver.

Treatment.—The diet should be light and nourishing. Alcohol is forbidden. A saline aperient is given in the morning. Tonics may be prescribed. Ascites (p. 231) is relieved by paracentesis (p. 88). When toxic symptoms threaten, purgation, diuretic treatment (p. 191), and injection of saline solution are prescribed.

Abscesses and tumours of the liver are usually treated surgically, otherwise the nursing is that already described.

DISEASE OF THE BILIARY PASSAGES AND GALL BLADDER

Acute Catarrh of the Bile Ducts (Cholangitis).—The symptoms are those described under jaundice (p. 232), and the treatment is that given under jaundice.

Suppurative Cholangitis, or Pus in the Biliary Passages.—*Symptoms.*—Pain may be slight or severe and paroxysmal resembling hepatic colic (p. 234). Pyrexia and a quick pulse are present, and rigors (p. 207) are frequent.

The treatment is surgical.

Gall Stones (Cholelithiasis), or Stones in the Biliary Passages.—*Cause.*—The primary cause is usually catarrh of the gall bladder.

Description of gall stones.—Solitary gall stones are ovoid or spherical and consist of almost pure cholesterin; they are nodular, amber-coloured, and glistening. They float in water. Multiple gall stones are more common. They are faceted from pressure against one another. They consist of cholesterin and bile pigment with calcium salts. They are greyish, brown, or black, and may be large or as small as sand. There may be two or three or there may be hundreds.

Symptoms.—*Hepatic colic* is characterized by an acute, sudden pain in the right hypochondrium, and radiates over the abdomen and into the back and shoulder. The pain is agonizing. Severe and frequent vomiting, a feeble pulse, and sweating accompany the attack. At the onset there may be rigors (p. 207) and pyrexia. There is great tenderness. The pain usually passes off after some hours, but may continue for days. It is brought to an end by the escape of the stone into the duodenum, or falling back into the gall bladder. Jaundice frequently supervenes.

Treatment.—During the attack, morphia is prescribed hypodermically, and chloroform may also be administered (p. 447). Hot fomentations (p. 90) or turpentine stupes (p. 91) are applied over the gall bladder. Hot drinks should be given. During the interval the cause of the gall stones is treated if possible. The diet must be carefully regulated. A saline aperient should be taken each morning, and plenty of water should be taken between meals. If the attacks recur, surgical treatment may be resorted to (p. 499).

DISEASES OF THE PANCREAS

Pancreatitis, or Inflammation of the Pancreas.—*Causes.*—Alcoholism and gall stones may be the cause.

Symptoms.—General ill-heath is common. Acute symptoms may arise, i.e. severe sudden pain in the region of the pancreas, vomiting, abdominal distension, and collapse (p. 562), with death after a few days.

Treatment.—Surgical treatment may be resorted to.

Pancreatic **Haemorrhage** may occur, and is treated surgically if diagnosed.

Pancreatic **Cysts**, calculi, and tumours are treated surgically.

DISEASES OF THE PERITONEUM

Ascites, or Dropsy of the Peritoneum.—*Causes.*—The causes are dropsy (p. 191) as a part of a general condition, compression of the portal vein, diseases of the peritoneum.

Symptoms.—The symptoms are an enlarged abdomen and bulging, especially in the flanks, shortness of breath, feeling of weight, etc.

Treatment.—Purgatives which cause watery evacuations are prescribed. Tapping (p. 88) may be required. (See treatment of dropsy, p. 191.)

Peritonitis, or Inflammation of the Peritoneum.—*Causes.*—Infection by microbes either from wounds or the digestive tract. (For symptoms and treatment see p. 512.)

Chronic Peritonitis.—The symptoms are not distinctive.

Treatment.—Attention must be given to the general health and regulation of the bowels. Ascites is treated if present.

Tuberculous Peritonitis.—In addition to the treatment described under tuberculosis (p. 318), a laparotomy (p. 510) may be performed.

DISEASES OF THE URINARY ORGANS

Nursing.—Particular observation on the following points is necessary: The amount and character, etc., of the urine (p. 186); the action of the skin, the amount and character of the sweat, etc.; the mental condition generally, the onset of drowsiness, delirium, and coma in particular. Insomnia is an important symptom in these cases and should always be reported.

Warmth is most essential, and is more important in kidney diseases than in any others. Acute cases are nursed between blankets or with a blanket next to them. The clothing should be of wool or flannel. Hot bottles should be kept in the bed continuously. Chills and draughts must be rigorously avoided or a relapse may ensue with fatal results.

Diet is important. In acute cases milk is the staple food; barley water, toast water, and bland drinks may be given in addition; albumin water and eggs are not allowed. Soup, meat, and alcohol are forbidden in nearly all cases. Lightly boiled eggs are allowed during convalescence.

Aperients form an important part of the medication; those aperients which produce watery evacuations are the ones prescribed, in order to get rid of the waste products and fluid by this channel, thus relieving the kidneys from some of their work.

Urine.—A daily specimen of urine should be put up and tested. In many cases, and in all acute cases, a specimen from the urine collected during 24 hours is required (p. 34). (For urine testing see p. 35.)

The *temperature, pulse, and respiration* are taken twice a day, and every four hours when pyrexia or rigors are present.

The unfavourable symptoms are temperature above 102° F. or below 97° F.; hard, quick pulse (p. 202); dyspnoea (p. 205); headache; vomiting; twitching; rigors (p. 207); drowsiness; insomnia; delirium (p. 210); decrease in the quantity of urine; increasing albuminuria (p. 236); increasing dropsy (p. 191).

Complications.—Anuria (p. 237), uraemia (p. 238), fits (p. 362), coma (p. 360) are all grave complications which may end fatally. Early recognition of their symptoms is necessary, and these should be reported to the physician without delay.

Abnormal Conditions of the Urine.—1. **Albuminuria,** or the presence of albumin in the urine. (For test see p. 35.)

Causes.—It may be due to actual disease of the kidneys, or may occur after pyrexia, or an epileptic fit (p. 381), or accompany various functional disorders, or embolism of the renal artery (p. 282).

Functional Albuminuria may occur without any discoverable disease of the kidneys. It is most common in adolescents, and may be intermittent, remittent, or paroxysmal. It may be due to cold bathing, muscular effort, particular articles of diet, or may be dependent on posture.

Treatment.—Tonics are prescribed, and any known cause is avoided if possible. These patients may continue to lead an ordinary life.

2. **Acetonuria.**—A condition in which ketones are present in the urine. It may occur as follows: (1) To a very slight extent in health; (2) in starvation; (3) in chloroform poisoning (p. 458); (4) in diabetes mellitus (p. 289); (5) in some cases of carcinoma; (6) in certain digestive disturbances. (For test see p. 38.)

3. **Diaceturia,** or presence of diacetic acid in the urine, occurs under the same conditions as acetone.

4. **Choluria.**—Indicates the presence of bile pigments and bile acids in the urine. It occurs in jaundice (p. 232). The urine varies from a green to a dark-brown colour. (For test see p. 38.)

5. **Chyluria** denotes the presence of chyle in the urine. The chief cause of chyluria is the obstruction of the lymphatic ducts by the Filaria sanguinis hominis (p. 229). Urine containing chyle is sometimes slightly pink from the admixture of blood. Ether dissolves the fat and renders the urine clear.

6. **Glycosuria,** or the presence of grape-sugar in the urine, occurs in diabetes (p. 289), and may occur temporarily in Graves's disease,

after accidents, shock, head injuries, and for a few hours after anaesthetics. (For test see p. 36.)

7. **Haematuria,** or presence of blood in the urine.—If blood is present in a large quantity, or comes from the bladder or urethra, the urine is red; if it is smaller in quantity and comes from the kidneys or ureters, the urine has a smoky appearance. (For test see p. 37.)

Causes.—Trauma, tumour, parasites, calculus, acute or chronic nephritis, turpentine and cantharides poisoning, haemorrhagic general diseases.

8. **Haemoglobinuria,** or blood pigment in the urine.—The chief causes are blood disintegration from acute infections, i.e. malaria (p. 326), typhoid fever (p. 341), yellow fever (p. 329), certain haemorrhagic diseases, scurvy (p. 304), purpura (p. 286), etc., certain poisons; absorption of haemorrhagic effusions; some cases of Raynaud's disease (p. 381). It occasionally results from exposure or over-exertion (paroxysmal haemoglobinuria).

9. **Indicanuria.**—Indican is a product of indol derived from the bacterial decomposition of proteids in the intestine. It does not colour the urine, but by oxidation it is converted into indigo-blue (p. 39). It is a constituent of normal urine. It is increased in all conditions which favour putrefaction in the small intestine, i.e. typhoid fever (p. 341), acute and chronic peritonitis (p. 235), etc.; or conditions associated with decomposition of pus, as empyema (p. 264), gangrene of the lung (p. 261), abscess, etc. (For test see p. 39.)

10. **Pyuria, or Presence of Pus in the Urine.**—It results from suppurative inflammation of any part of the genito-urinary tract, or from rupture of an abscess into the tract. The urine contains a dense creamy white sediment; it may be offensive. If present in small quantities no deposit is seen, but the specimen is cloudy. (For test see p. 37.)

11. **Tube Casts.**—Casts of the uriniferous tubules may be present in the urine. They vary in character according to the region from which they come, the material of which they consist, and the disease with which they are associated.

Different varieties are hyaline, waxy, granular, epithelial, fatty, blood, and pus. They are detected by the microscope.

Suppression of Urine (Anuria).—A condition in which no urine enters the bladder; it may be obstructive or non-obstructive. Obstructive suppression may result from calculus (p. 244), cancer of the uterus, double hydronephrosis (p. 239), and as the result of operative errors. Non-obstructive suppression may be due to nephritis (p. 241), lesions of the abdomen, passage of the catheter (p. 66), and very low blood pressure (hypopiesis).

Symptoms.—There may be diminished quantity of urine to start with, the urine becoming less and less until none is secreted or passed. There may be insomnia and muscular enfeeblement, but the mental functions are sound. Later, muscular twitchings, contracted pupils, dryness of the tongue, anorexia, slight delirium may be noted. Death occurs within two to ten days.

Treatment.—In the obstructive form, surgical treatment is given. The treatment of the non-obstructive form is given under nephritis (p. 241).

Retention of Urine.—A condition in which the urine is retained in the bladder.

Causes.—Loss of tone of the bladder (atony), over-distension, abdominal operations, stricture of the urethra, hypertrophy of the prostate gland, hysteria, maintenance of an unaccustomed position, some nervous diseases.

Treatment.—When due to a definite disease such as enlarged prostate, disease of the spinal cord, stricture, etc., the retention is relieved by regular catheterization. In some cases of stricture of the urethra when the catheter cannot be passed, supra-pubic cystotomy is performed (p. 492). Cases of retention due to functional causes such as an unaccustomed position after operation, etc., should have the following treatment tried before resorting to the use of the catheter: (1) douching the external genitals with hot water; (2) fomentations (p. 90) over the bladder; (3) a hot simple enema (p. 61) if permissible; (4) suggestion, i.e. allowing the patient to hear water running from a tap; (5) sitting up, or knee-elbow (Fig. 258) position if the condition allows of altering the posture. If these means fail, the catheter must be passed, but each time subsequently, when the patient is to be relieved, these means should be tried before resorting to the catheter. (For method of passing the catheter see p. 66.) If the bladder becomes over-distended, there may be incontinence of urine as well as retention; this condition is known as 'overflow incontinence.' A patient should never be allowed to get into this condition. When catheterizing a much distended bladder, the bladder must not be emptied completely at the first time or atony of the bladder may result. One to one and a half pints of urine are withdrawn, and after an interval of 2 hours the bladder is emptied completely and catheterization continued every 4, 6, or 8 hours until the patient is able to pass urine. In no case, with the exception of hysteria, should retention be allowed to continue over 12 hours, or the bladder may become atonic. The wishes of the physician or surgeon should always be ascertained before passing a catheter.

Uraemia.—Uraemia is a condition which follows retention in the blood of waste products of metabolism which are usually eliminated by the kidneys.

Causes.—Any condition (except hysteria) which interferes with the secretion or passage of urine. Uraemia may be acute or subacute.

Symptoms.—In acute uraemia, the onset is sudden, or the symptoms develop quickly in the course of a few hours. Headache, drowsiness, anorexia (p. 210), and thirst are followed by convulsions (p. 588), or coma (p. 360), or both. Convulsions are common and may be preceded by muscular twitchings. The fits, which are epileptiform (p. 386) in character, may be slight or severe as regards the spasm. One fit may follow on another immediately (status epilepticus, p. 388), or there may be an intervening period of coma. With numerous and severe convulsions, hyperpyrexia (p. 195) may be present. Coma is very common either with or without convulsions, but either or both may be present either at the onset or at the end of the chronic form of nephritis. Other phenomena of the condition are delirium, insanity, and hemiplegia (p. 377). Recovery may take place if the nephritis subsides.

Chronic Uraemia.—The symptoms are less urgent and more varied but may at any time become acute. Headache, vomiting, diarrhoea, anorexia, rapid pulse, insomnia, muscular weakness, and erythematous affections of the skin may be present. The temperature is subnormal, dyspnoea may be very marked. Grave symptoms are a gradual fall in temperature with an increasing drowsiness from day to day, Cheyne-Stokes's respiration, diminished quantity of urine, or suppression. These symptoms may lead to coma and death, or the more acute symptoms may result.

Treatment.—See nephritis, p. 241.

Dropsy in Kidney Disease.—The distinctive renal dropsy includes both anasarca, involving all the surfaces, especially the parts where the tissues are loose, i.e. the eyelids, scrotum, etc., and dropsy of the serous cavities. Once the anasarca has become considerable the fluid tends to gravitate to the most dependent parts, e.g. the side the patient lies on, or the hands, feet, lumbar region.

Treatment (see dropsy, p. 191).—The causative disease is treated.

Hydronephrosis.—Hydronephrosis, or dilatation of the pelvis and calices of the kidneys, is due to obstruction in the urinary tract.

Symptoms.—If slight, there may be no symptoms. If marked, there is a swelling over the kidney region. The hydronephrosis may be intermittent. In single hydronephrosis the urine may not be diminished in quantity, but if double, the urine is much diminished.

Treatment.—Surgical treatment is generally required for the removal of the obstruction.

Pyelitis, Pyelonephritis, and Pyonephrosis.—*Pyelitis*, or inflammation of the pelvis of the kidney, may occur by itself or may be associated with *Pyelonephritis*—inflammation and suppuration of the kidney substance (surgical kidney), which may in turn lead to *Pyonephrosis*—a condition in which the ureter becomes obstructed, resulting in the kidney becoming converted into a pus-containing sac.

Causes.—The causes are infection either from the urinary tract, bacillus coli infection, or from the blood, or from injury.

Symptoms.—In cases of pyelitis the symptoms may not be marked. They include pain in the back, frequent micturition, and pus and epithelium in the urine (p. 37). In severe cases there may be pain and tenderness in the region of the kidney, the pain being aggravated by movement and deep breathing. Haematuria (p. 237) may be present as well as pyuria (p. 237). Pus in acid urine denotes pyelitis. In pyelonephritis and pyonephrosis the constitutional evidences of suppuration appear (p. 838). In pyonephrosis there may be local pain, tenderness, and swelling. In these circumstances the ureter may become blocked for a time; the pus then disappears from the urine, and the swelling increases. If the obstruction yields, a large amount of pus is passed and the tumour disappears.

Treatment.—The treatment includes rest in bed until the temperature is normal. The bowels need to be carefully regulated.

The *diet* should consist of plenty of bland fluids such as barley water (p. 819) and diluted milk; a ketogenic diet (p. 797) may be ordered. Nitrogenous food should only be given in small quantities. A urinary antiseptic may be prescribed, either hexamine, pyridium, or sulphanilamide, and if cystitis (p. 245) is present, the bladder will be washed out daily (p. 70). Latterly, treatment with mandelic acid has proved of benefit: 12 grammes of mandelic acid given daily in four doses, each dose of 3 grammes of acid being neutralized with 1–6 grammes of soda bicarbonate, flavoured with lemon, and diluted to 1 or 2 fluid ounces with water. Sodium mandalate is now often used in place of the acid and bicarbonate of soda, 3·43 grammes of sodium mandalate equals 3 grammes of mandelic acid. During treatment with mandelic acid, ammonium chloride, 2 grammes three times a day, may be administered to regulate the degree of acidity of the urine. The diet during this treatment may be a modified ketogenic diet (p. 797), carbohydrates being restricted and fats greatly increased. Fluids may also be restricted to 2 pints daily. Irritation of the kidney may supervene and is shown by albumin in urine which was previously normal; other symptoms of intolerance are nausea, vomiting, and diarrhoea. Pathological examination of the urine is carried out periodically during the treatment. Another treatment is by sulphanilamide or sulphathiazole (M & B 760). During this treatment the patient should take 3 pints of fluid per day. Alkalis are administered in sufficient quantity to keep the urine alkaline (see p. 777). Tonics and change of air are required during convalescence. Surgical treatment may be required in pyelonephritis and pyonephrosis.

Perinephritic Abscess.—Inflammation of the cellular tissues around the kidney.

Causes.—The causes are local injury, extension of suppuration from the kidney, pelvis of the kidney, ureter, or from appendicitis (p. 231), empyema (p. 264), spinal caries (p. 618), etc., or it may result from a chill or follow an acute fever.

Symptoms.—The onset may be gradual or acute, with pyrexia, constipation, and concentrated urine. Local pain radiates down to the thigh or groin. The leg on the affected side may be flexed and the body inclined to that side. Pus may or may not be present in the urine. In a few cases the perinephritis ends in resolution, but more commonly suppuration (p. 838) takes place. There may be swelling over the affected part or the skin may be oedematous (p. 190).

Treatment.—At the onset, rest in bed, aperients, cupping (p. 104), and poulticing (p. 91) are ordered.

Light diet is given. As soon as pus forms the treatment becomes surgical.

Acute Nephritis, or Acute Bright's Disease, or Inflammation of the Kidney.—*Causes.*—The causes are scarlet fever (p. 332), diphtheria (p. 349), or other acute fevers, tonsillitis (p. 669), exposure to cold and wet, pregnancy (p. 690). Many cases arise without any known cause.

Symptoms.—The symptoms are rigors (p. 207), vomiting, nausea, headache, backache. The skin is dry and hot, pallor is a marked and early symptom, the pulse full and hard. Pyrexia is moderate; the bowels are constipated. The urine is scanty, high-coloured, turbid, or of a smoky colour with a copious sediment and high specific gravity (p. 35). The urine contains blood, albumin, and casts (p. 237), and the quantity of urea is diminished. Increased frequency of micturition is present. Dropsy (p. 191) often appears early and may be the first symptom noticed. It is detected in the eyelids, hands, ankles, and lumbar region, and may involve serous cavities. Bronchial catarrh (p. 248) is frequently present. Blindness is occasionally observed. One attack predisposes to another; great care is therefore needed during convalescence.

Treatment.—Rest in bed between blankets is usual. The clothing should be of wool or flannel. The room must be warm and the patient well protected from draughts (p. 5).

Diet.—During the acute stage, the diet is restricted to milk diluted with barley water (p. 820) or soda water, and it may be necessary to restrict the fluid to 3 pints a day or less, and to supplement this by the addition of farinaceous foods such as Benger's food, gruel, etc. If the urine is very scanty and the dropsy rapidly increasing, it may be necessary to restrict the fluid to one pint of milk in 24 hours. After the acute stage is past, liquids and farinaceous foods are given freely. Diluted milk, cocoa, weak tea, or imperial drink (p. 820), porridge, rice, gruel, bread and milk, etc., may be given. Later, bread and butter, fish, vegetables, and fruit are allowed. See low protein diet, p. 794.

Drugs.—Aperients and diaphoretics (p. 767) are prescribed in the acute stage and until all acute symptoms have subsided. Compound jalap powder is the usual aperient prescribed. Diuretics (p. 767) are ordered after the acute stage.

Hot-air baths (p. 112), hot packs (p. 109), etc., are ordered to promote sweating and increase the activity of the skin and so get rid of the toxins. Pilocarpine may be injected hypodermically (p. 84) before the pack or hot-air bath.

If symptoms of suppression (p. 237) or uraemia (p. 238) are threatening, either dry cupping (p. 104), or poultices (p. 91) to the loins may be prescribed. If the dropsy is severe, salt may be excluded from the diet (p. 793), serous cavities may require tapping (p. 89) or aspirating (p. 87), and superficial tissues may require puncturing (p. 89). Convulsions (p. 588) are controlled by chloroform (p. 447), and bromide and chloral may be administered by the rectum (p. 60). Uraemic convulsions (p. 239) are sometimes treated by lumbar puncture (p. 86). Morphia may be ordered. The difficulty of distinguishing between the effects of morphia and the onset of coma (p. 360) is a drawback to the use of the drug. If vomiting is obstinate, ice may be given and a mixture of bismuth may be prescribed. A mustard leaf (p. 94) to the epigastrium may stop it for a time. Food may have to be administered by rectum if vomiting continues.

The patient is kept in bed until all acute symptoms have subsided. Convalescence is slow, relapses are common. Subsequently great care must be taken to avoid cold and damp; the underclothing should be of a woollen mixture.

N.B.—Particular note must be made in these cases as to the exact quantity of urine passed in the 24 hours, the amount and character of perspiration.

Complications which may arise are uraemia (p. 238), coma (p. 360), convulsions (p. 588), suppression of urine (p. 237).

Chronic Nephritis (Tubal, Tubular, or Diffuse Nephritis, Large White Kidney).—This is a chronic form of nephritis which follows an acute attack, or arises spontaneously.

Symptoms.—The symptoms are similar to those of a continuance or a relapse of the acute nephritis. Retinal changes are common.

Treatment.—The patient is not always confined to bed, but must be well and warmly clad.

The *Diet* is not restricted except meat, which is forbidden or only allowed once a day. Stimulants and alcohol are not allowed. If dropsy is severe, the patient will have to be confined to bed for the treatment of it; other treatment is that already described under acute nephritis.

Chronic Interstitial Nephritis (Small Red Kidney).—*Causes.*—The causes are gout (p. 312), alcoholism, over-eating, lead-poisoning (p. 383), exposure, heredity. In many cases no definite cause can be adduced.

Symptoms.—General failing health, headache, loss of flesh, weakness, anorexia (p. 210), occasional vomiting, shortness of breath. Frequency of micturition is common. The urine is more abundant than normal (polyuria) and of low specific gravity (p. 35). It may contain small quantities of albumin, casts, and occasionally blood (p. 237). The pulse tension (p. 202) is raised. Changes in the retina are common, and there may be haemorrhages, neuritis, and retinitis (p. 635); the patient complains of blurred vision.

Among the *complications* are eczema (p. 418), diarrhoea (p. 186), epistaxis (p. 668), purpura (p. 286), bronchitis (p. 248), pleurisy (p. 262), pneumonia (p. 251), and pericarditis (p. 274).

Treatment.—Removal of the cause if possible is most important combined with regulation of the bowels and dieting. The skin is rendered active by the use of hot-air baths (p. 112), packs (p. 109), etc.

Diet.—Alcohol and highly-seasoned dishes are not allowed. Strict moderation in eating and drinking should be observed. Meat or eggs may be allowed once a day.

The patient is not confined to bed unless acute symptoms or complications supervene, when the treatment is that already described but carried out with greater rigour.

Tumours of the Kidney.—These are mainly malignant or tuberculous (p. 318).

Symptoms are pain, tumour, and haematuria (p. 237).

Treatment.—Surgical treatment is possible in some cases. In others, relief is given as the symptoms arise.

Movable Kidney, or Nephroptosis.—This condition is one in which the kidney slips from its natural place.

Causes.—The causes are emaciation, relaxation of the abdominal wall, visceroptosis, tight lacing, and accidents.

Symptoms.—A movable kidney may cause no trouble, and the patient may not be aware of it. In other cases, symptoms of neurasthenia (p. 394) are present, with dyspepsia. In still other cases there may be well-marked febrile attacks closely resembling appendicitis (p. 231). Occasionally severe attacks of abdominal pain, vomiting, scantiness of urine, and haematuria (p. 237) occur.

Treatment.—Mild cases require a belt or corset which will keep the kidney in position. In others where emaciation and neurasthenic symptoms are marked the patient is put to bed and goes through a course of treatment to produce fat, or the operation of nephropexy is performed (p. 489).

Calculus in Kidney, or Nephrolithiasis.—*Causes.*—The causes are unknown, but probably the pathology is similar to that of gall stones (p. 234). Changes in the urine and in the pelvis of the kidney are important.

Symptoms.—Renal colic is the most marked symptom.

Renal Colic.—In renal colic pain is felt in the region of the kidney extending round to the abdomen, and down the thigh and towards the genitals. The pain varies from a dull ache to an acute, almost unbearable paroxysm, during which the thigh is flexed to relax the abdominal wall; the patient vomits frequently, may have a rigor (p. 207), becomes faint and collapsed, perspires profusely, and may roll about on the floor or bed. The urine may be retained or there may be a constant desire to micturate, only a small quantity of urine being passed on each occasion. Blood or deposits of various crystals are frequently found in the urine.

Treatment.—During an attack a hot bath or hot fomentations (p. 90) help to relieve the pain, but in many cases relief is only obtained by hypodermic injections of morphia, or by the administration of chloroform (p. 447). The duration of the attack varies from a few seconds to many hours. The urine passed during an attack should be saved, as the presence of blood or crystalline deposit is of much assistance in determining the nature of the stone or other complaint. In the less severe cases a hot bath and fomentations may suffice, and morphia or chloroform are not required. In between the attacks abundance of liquid, of which water is the best form, should be drunk between meals.

The passage of sand or gravel, which are actually small stones, suggest the presence of larger calculi in the urinary passages. If the stone is not passed, surgical treatment is resorted to (p. 489). In any case the kidney is usually X-rayed (p. 723) to see if other calculi are present.

In these cases an attack of renal colic may often be brought on after riding in an omnibus, train, etc., or after any violent exercise or jolting.

DISEASES OF THE BLADDER

Cystitis, or Inflammation of the Bladder.—*Cause.*—The condition is due to microbic infection which may be introduced by careless catheterization (p. 66), or may spread upwards from the urethra. Microbes are constantly excreted through the urine, and produce no ill effect, if in small quantities, unless the bladder wall is irritated by the presence of a stone or tumour, or by retained urine or over-distension. Where the organisms are present in large quantities, e.g. in pyelitis (p. 240) or septic kidney (p. 241), cystitis is very likely to ensue.

Symptoms.—The symptoms are frequent micturition, with scalding pain on passing urine, pain over the pubes and perinaeum which is relieved by emptying the bladder. In severe cases there may also be rigors (p. 207), pyrexia, a feeble rapid pulse, and symptoms of toxic poisoning (p. 577). The urine is alkaline, offensive, and contains muco-pus (p. 37).

Treatment.—Rest in bed is essential. The diet is liquid during the acute stage—milk, barley water, etc. Later, light solid food is given.

Drugs.—Sulphapyridine (M & B 693) or sulphathiazole (M & B 760), hexamine, and hyoscyamus are the usual drugs ordered. Opium is prescribed for the relief of pain. The bladder may be washed out daily (p. 70) either with weak sterilized boracic lotion, permanganate of potash, or other solutions according to the stage of the disease. Fomentations (p. 90) may be applied over the bladder.

Other diseases of the bladder, malignant growths (p. 314), polypi, calculi, etc., are treated surgically (p. 492).

DISEASES OF THE URETHRA

Urethritis, or Inflammation of the Urethra.—Inflammation of the urethra may be caused by injury, or infection by the gonococcus or other organisms. The treatment consists in applying local remedies, internal medication, etc. Rest in bed is not generally prescribed.

Urinary Fever, or Catheter Fever.—This term is applied to a fever following the introduction of instruments into the urethra. It may occur in any patient, but it is more common in those who have some disease of the urinary organs.

Cause.—Infection, which may be brought about by careless or insufficient sterilization of the hands or instruments; or by causing an abrasion of the mucous membrane through which toxins of organisms present in the urethra become absorbed. If toxins only are absorbed, the fever is of short duration, but if bacteria get into the tissues, complications may result which may even prove fatal.

Symptoms.—The patient is suddenly seized with a rigor (p. 207)—temperature may rise to 105° F.—severe headache, and feels very ill. In a straightforward case the temperature falls to normal within a few hours; the patient then feels better and recovers completely within a few hours. In other patients the temperature does not fall to normal after the rigor, but pyrexia may continue for several days, or rigors may recur. After a varying time the pyrexia subsides, the patient gradually regains strength and completely recovers. In more serious cases the temperature does not come down and any of the following complications may supervene: suppression of urine (p. 237), uraemia (p. 238), pyelonephritis (p. 240), or pyaemia (p. 577).

Treatment.—The usual treatment for the rigor is to be given (p. 207). Quinine is administered every four hours until the temperature has fallen, then three times a day. The patient must be kept warm and protected from chills. The bowels are kept active by means of a saline aperient.

Light diet, chiefly milk, is given until the pyrexia has subsided. Catheterization or the passage of instruments is discontinued.

CHAPTER VII

MEDICAL NURSING (*continued*)

DISEASES OF THE RESPIRATORY SYSTEM

Nursing.—The special points to be observed in the nursing of these cases are a free supply of fresh air without draught, an even, warm atmosphere, and the exclusion of dust, etc., which may induce cough. Particular observation should be directed towards cough (p. 208), expectoration (p. 183), respiration (p. 205), pulse (p. 201), dyspnoea (p. 205), and cyanosis (p. 188).

The temperature, pulse, and respiration are taken every four hours during the acute stage, then twice a day. Many of these cases are nursed semi-propped up (Fig. 11), or propped up with pillows (p. 27) and a bedrest. A substitute for a bedrest may be made by inverting a chair to form an inclined plane, and covering it with pillows. During the acute stage, and while there is any dyspnoea, these patients should not be allowed to exert themselves in any way, everything should be done for them by the nurse, in order that the strength may be preserved as much as possible and the heart relieved. There is often difficulty in procuring sleep. If narcotics are ordered, special watch must be kept on the respiration and the patient's colour. In severe cases oxygen is commonly prescribed, for the administration of which see p. 107.

The *diet* is very important, and should consist of nourishing fluids until the temperature is sub-febrile (p. 195); later light solids are given and gradually increased. The patient must be well fed and have extra milk and eggs. During the acute stage food is given at frequent intervals in order that the stomach may not become dilated and so impede respiration. A quantity of ℥v every 2 hours should be given, chiefly consisting of milk, egg flip, coffee made with milk, fruit juice with glucose, etc. The patient is usually allowed to miss one 'feed' during the night if sleeping comfortably, an extra quantity being given at the two following.

The bowels must not be allowed to become constipated, but, on the other hand, aperients need to be given with caution in order that the patient is not rendered weak from diarrhoea. The above nursing applies to all diseases of the respiratory system unless contra-indicated. Alterations or additions required for any given diseases will be found under their respective headings.

Unfavourable symptoms are cyanosis, increasing dyspnoea, rapid respiration, a rapid and irregular pulse, a sudden rise in temperature, or a sudden fall accompanied by a rise in pulse and respiration rate, cold extremities and surface accompanied by cold sweating, a sudden fall in respiration rate without corresponding improvement in temperature, pulse, and the general condition.

DISEASES OF THE BRONCHIAL TUBES

1. **Acute Bronchial Catarrh.**—*Bronchitis.*—An inflammation of the bronchial tubes, characterized by substernal soreness, cough, and muco-purulent expectoration.

Causes: Predisposing are constitutional debility, former attacks, sedentary life, heart disease, Bright's disease (p. 241), mouth breathing, infection of micro-organisms.

Exciting causes are found in cold and damp, sudden change of temperature, inhalation of irritating dust or fog.

Symptoms.—The symptoms are chilliness; malaise; a sense of soreness and constriction behind the sternum which is increased by coughing; slight fever (100°-102° F.) with its associated symptoms (p. 195); cough, which is at first dry and painful. The sputum at first is scanty and sickly, later becomes more abundant and either purulent or muco-purulent (p. 184).

Treatment.—Rest in bed in the recumbent or semi-recumbent position, or propped up, whichever is the most comfortable (see position, p. 26), is necessary.

Medicines.—A cough mixture is ordered either stimulating or sedative according to the needs of the case; stimulants are frequently ordered in the case of young children or old people; diaphoretics (p. 767) may be ordered.

External treatment.—Inhalations of turpentine, menthol, or friar's balsam are soothing. Linseed or mustard poultices (p. 91), antiphlogistine (p. 103), or friction with liniments (p. 95) relieve pain. A steam kettle and tent (Fig. 50), or half tent, is used in severe cases; drugs added to the steam kettle ensure a continuous inhalation of the drug. The latest treatment is by penicillin mist (Aerosol), described on p. 841. Oxygen inhalation may be necessary.

2. **Capillary Bronchitis.**—In capillary bronchitis, or inflammation of the smaller bronchial tubes, the purulent secretion, by blocking the bronchioles, causes collapse of the corresponding lobules of the lungs.

Cause.—It may be an extension from the larger tubes or may arise independently. It occurs chiefly in children and frequently accompanies measles (p. 333) or whooping-cough (p. 354). (For symptoms and treatment see broncho-pneumonia, p. 254.)

3. **Chronic Bronchitis.**—Chronic bronchitis occurs commonly in elderly people, and frequently during cold and wet weather.

Causes.—Previous acute attacks, heart disease, kidney disease, gout, inhalation of irritating substances, asthma, emphysema, diseases of the nose and throat are predisposing conditions.

Treatment.—Warm but light clothing, wintering in a warm, dry climate, avoidance of damp and cold, remedying the cause if possible, are advocated. The patient is not kept in bed unless there is likelihood of an acute attack supervening.

4. **Membranous Bronchitis.**—This is a rare disease, occurring at any age.

Symptoms.—The disease may be acute or chronic. The symptoms are those of bronchitis with increasing dyspnoea, and the expectoration of casts which consist of fibrinous moulds from some of the bronchial tubes, which may be expectorated whole or in smaller pieces, sometimes with haemoptysis (p. 259). The treatment as far as the nursing is concerned is that already given under bronchitis.

5. **Bronchiectasis.**—Dilatation of the bronchial tubes; commonly follows some other lesion of the bronchi or lungs.

Symptoms.—The symptoms are those of bronchitis (p. 248). If a large bronchiectasis is present in which secretions accumulate, a characteristic symptom is cough in acute paroxysms, occurring from time to time, associated with copious expectoration. These paroxysms may be induced by change of posture. The sputum at first resembles that of bronchitis; later it becomes foetid. The foetid sputum, on standing, settles into three layers: the top one is frothy, the middle one watery and comparatively clear, the lowest one dense and purulent (see sputum, p. 184).

Treatment.—The most recent treatment is by penicillin mist (Aerosol), described on p. 841. Intratracheal injections (p. 650) may be given by the physician. Postural treatment is usually ordered and consists in the patient adopting at regular intervals the position found by experience to promote evacuation of the cavity. The posture, of course, varies with each according to the position of the bronchiectasis. A few patients are treated surgically.

6. **Asthma.**—In asthma, sudden attacks of acute dyspnoea occur at irregular intervals. It is more common in men than in women. Asthma may be accompanied by bronchitis.

Causes.—Spasm of the muscles of the bronchial tubes, associated with swelling of the mucous membrane of the smaller bronchial tubes which may be associated with bronchial catarrh, polypi, goitre, and other nasal and throat affections. The tendency is frequently inherited. The disease is almost always associated with the 'allergic state' (p. 304). The hypersensitiveness to proteins may be caused by certain articles of diet, the inhalation of various kinds of dust, the emanations of particular plants, or animals. Exciting causes are found in emotional states—fright; an overloaded stomach, anxiety. Stimuli to the nose, and irritation of the nasal membrane, or the presence of polypi are responsible in some cases. It may follow an acute respiratory infection such as whooping-cough (p. 354), or pneumonia.

Symptoms.—The onset is sudden. The patient sits up in bed feeling suffocated, and struggles for breath; usually expiration is prolonged and accompanied by a loud wheezing sound (p. 205), whilst inspiration, in spite of violent efforts, is almost impossible. The paroxysm of intense dyspnoea may last from a few minutes to many hours, and generally ends with expectoration of sputum consisting of small pellet-shaped masses. A dry hard cough is present in some cases. In those cases in which catarrh of the bronchial tubes follows the attack, the sputum in the course of a few days changes its character and becomes muco-purulent (p. 183).

Treatment.—The treatment is twofold: first, prevention of the attack by treatment of the 'allergic state'; secondly, to relieve the spasm when an attack has taken place. The methods of determining the cause of the hypersensitiveness and methods of desensitization are given in 'allergic state' (p. 304). If caused by an infection, a vaccine may be prepared. Vaccine prepared from the asthma bacillus produces relief in suitable cases. In children good results have followed the use of glucose. There is a tendency for asthmatic children to suffer from ketosis (p. 289) from slight causes, such as excitement of going to a party, etc. These children are usually of a nervous type and their energy uses up all their reserve of available carbohydrate, resulting in ketosis. One ounce of powdered glucose in a tumbler of water with orange or lemon juice taken last thing at night or first thing in the morning has been found to be of benefit. Breathing exercises (p. 752) are of great importance, especially in children. Changes of air from town to country, or vice versa, sometimes relieves the condition. Hyperthermia (p. 113) has proved effectual. Only light meals should be taken in the evening. Any known food which causes an attack should be avoided until desensitized (p. 305).

Treatment of an acute attack is obtained by a hypodermic injection of adrenalin chloride, strength 1 1000, dose 2–15 minims

(0·12 to 1 c.c.). The earlier in the attack it is given the less is required and the better the result. The patient may be taught to administer the injection himself. Ephedrine is efficacious by mouth but needs to be taken hours before the attack is expected, and after a time it loses its effect.

The drugs most commonly used are potassium chloride, ephedrine, stramonium. Penicillin mist (Aerosol) is the most recent treatment (see p. 841). Various powders containing stramonium and potassium nitrate, if burnt, give off a vapour which contains atropine and gives relief if inhaled, but this method may cause bronchitis from the irritating nature of the vapour.

Status Asthmaticus is a condition in which the patient suffers from severe and constant asthma, no relief being obtained day or night. For this, the Hurst method of injecting adrenalin has been found successful. The hypodermic needle is inserted under the skin and 1 minim of adrenalin is injected every minute until the attack ceases or the pulse rises abnormally. The needle is not withdrawn until the attack is over.

DISEASES OF THE LUNGS

1. **Pneumonia.**—Lobar pneumonia, or acute, fibrinous, or croupous pneumonia, is an acute inflammation of the lung substance occurring as part of a general infection.

Causes.—*Predisposing causes* are cold, damp, over-fatigue, old age, alcoholism, or any circumstance which diminishes the resisting power of the body, or of the lungs in particular.

The *exciting cause* is infection by Frankel's pneumococcus, or diplococcus pneumoniae, which may practically always be found in the throat of even the most healthy individuals. Acute pneumonia sometimes appears in epidemic form (p. 330).

Symptoms.—The onset is acute, commences with a rigor (p. 207) and an acute pain in the chest. With children the onset may be a convulsion (p. 362). Pain is sometimes referred to the abdomen. The temperature rises rapidly to 103° F. or 104° F. or higher; the pyrexia is continuous, though it may vary during the course of the day. The pulse is much accelerated (110–140), but the respiration is proportionately still more disturbed (35–60). Usually between the fifth and the tenth days the temperature falls by crisis (p. 193), frequently reaching normal within twelve hours. The pulse and respiration rates diminish synchronously, and there may be profuse sweating with collapse (p. 562). A pseudo-crisis may occur a day or two before the crisis (see chart, Fig. 168), and occasionally the defervescence is by lysis (p. 197). The patient lies on his back or on the affected side, breathing very rapidly, the alae nasi (p. 206) move with respiration, and expiration may be accompanied with a grunt; there is a short painful cough; the sputum is scanty and tenacious, later rusty coloured and more copious, and in severe cases prune juice sputum is present (p. 183); the face is flushed and may be more marked on the side of the pulmonary lesion; there is often an eruption of herpes (p. 416) about the mouth or nose; the pupils may be unequal; the urine is concentrated and diminished in quantity; the chlorides are deficient or absent. As the disease progresses the pain becomes less severe; the pulse becomes softer; the tongue may be coated or dry and nearly clean; insomnia is often obstinate; delirium (p. 359) is frequently present, especially at night; in drunkards the delirium may take the form of delirium tremens (p. 359). Diarrhoea with green stools may be present, also incontinence of urine.

Treatment.—Complete rest in bed in the recumbent position is usual; cases with dyspnoea may be propped up, but not allowed to sit up.

Nourishing liquid is necessary until after the crisis, given in quantities of 5 ounces every 2 hours—milk, egg flip, white coffee, fruit juice with glucose, milk bovril, etc. Regular feeding is most important, but, on the other hand, sleep is equally so.

Sulphapyridine (M & B 693) or sulphathiazole (M & B 760) given from the onset in conjunction with penicillin have proved very efficacious; the dosage and administration are described on pp. 776 and 840. During the acute stage aperients need to be used with caution to avoid diarrhoea. Some physicians prefer the use of enemata. Rectal saline infusion is indicated when thirst or much toxaemia is present. Pyrexia, over 104° F., is treated by tepid or cold sponging. Cold sponging may also be given every 3–4 hours as treatment for toxaemia. Cold packs may relieve cases attended with severe head symptoms. Commenced early, the administration of oxygen, either by B.L.B. mask or nasally, is of value (see pp. 107). Venesection to the extent of 15–20 ounces is practised when cyanosis becomes marked. A steady rise in frequency of pulse rate, or the appearance of lividity beneath the finger nails or about the lips and ears, is a sure indication that the heart is feeling the strain and that stimulants are necessary. Alcohol, caffeine, digitalis are given by mouth, and camphor, strychnine, coramine, or adrenalin given by hypodermic injection may be necessary.

The mouth needs careful cleansing throughout the disease, sordes removed, cracks treated with an oily preparation such as liquid paraffin to heal them; the nose requires similar attention. The lips are kept moist. A cotton-wool jacket (p. 147) is usually applied to the chest; other external applications which may be ordered include antiphlogistine (p. 103), linseed (p. 91) or mustard poultices (p. 92), fomentations (p. 90), ice poultice (p. 92), ice-bag (p. 93).

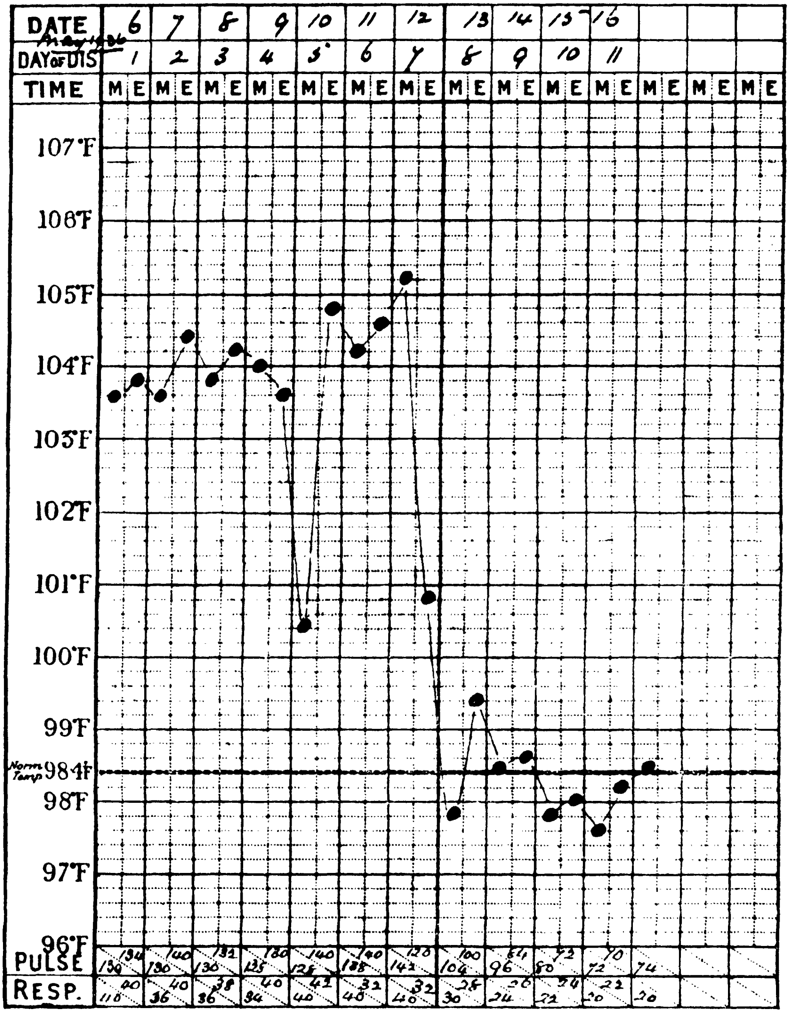


FIG. 168. Daily chart of a case of pneumonia showing a pseudo-crisis on the fifth day and crisis on the seventh.

Insomnia may require drugs to induce sleep, which is of great importance. Paraldehyde is safe and usually effectual and may be given either by mouth or by the rectum, morphia is often used during the first few days but is dangerous at, or near, the crisis; bromide and chloral, medinal, or allonal are useful. When hypnotics are prescribed the nurse must keep careful watch on the patient's pulse and respiration during sleep.

Special nursing points.—Any exertion on the part of the patient until after the crisis must be prevented: this includes moving, talking, or any action that throws more work on the lungs. Temperature, pulse, and respiration are taken every four hours or oftener until the crisis is past, then twice a day. In addition, careful and frequent observation of pulse and respiration, colour, and dyspnoea must be made. When the crisis is expected, hot-water bottles, hot blankets, oxygen, stimulants, and hypodermic syringe with strychnine (p. 84) should be in readiness, also hot towels, and warm a dry garment in case there is much sweating, so that the patient may be rubbed down. The successful issue of a case of pneumonia very largely depends on vigilant and careful nursing. Good nursing consists in observation of the points mentioned; conscientious application of the treatment ordered; regular administration of drugs and food in correct quantities; noting and reporting any untoward symptom to the physician in charge immediately. After the crisis the patient usually progresses quickly to convalescence. The diet is increased, light solid diet is given and increased to full diet. The patient is allowed to help himself as his strength returns, and usually allowed up about a week after the temperature is normal.

Unfavourable symptoms are increasing dyspnoea with cyanosis; weak, rapid pulse; rapid respiration with restlessness; the temperature persisting above 104° F.; a drop in temperature with rise in pulse and respiration rate; a dry tongue and delirium with only moderate fever; coma; vomiting; diarrhoea. The chief danger during the first ten days is sudden exhaustion of the vaso-motor centre leading to dilatation of arterioles and capillaries: this starves the heart of blood and death ensues. The prognosis is grave when the disease occurs in patients over 60 years of age, in drunkards, and in those who have either heart or renal disease. *Complications:* toxaemia (p. 577), empyema (p. 264), pulmonary gangrene (p. 261), abscess of lung (p. 262).

2. Broncho - pneumonia. — *Aspiration pneumonia.* — Bronchial pneumonia, lobular, or catarrhal pneumonia is an inflammation of the smaller bronchial tubes and adjacent parts of the lung. It occurs most commonly in children and old people.

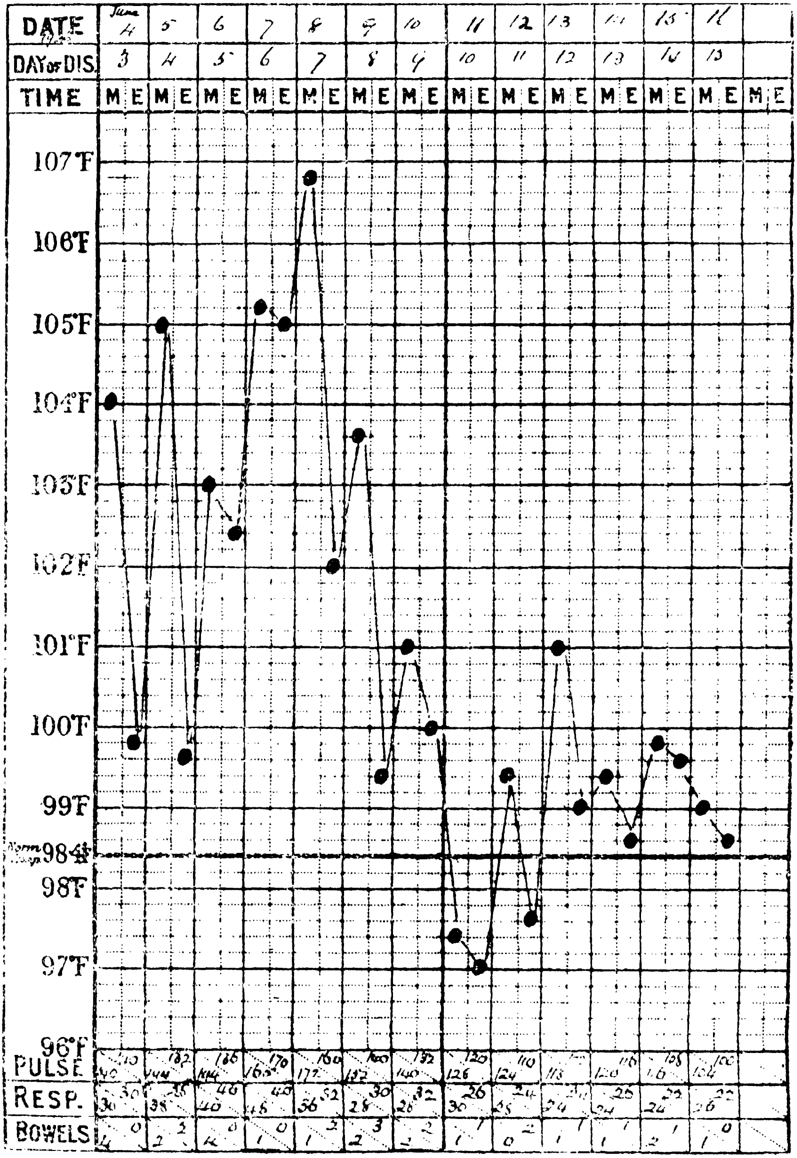


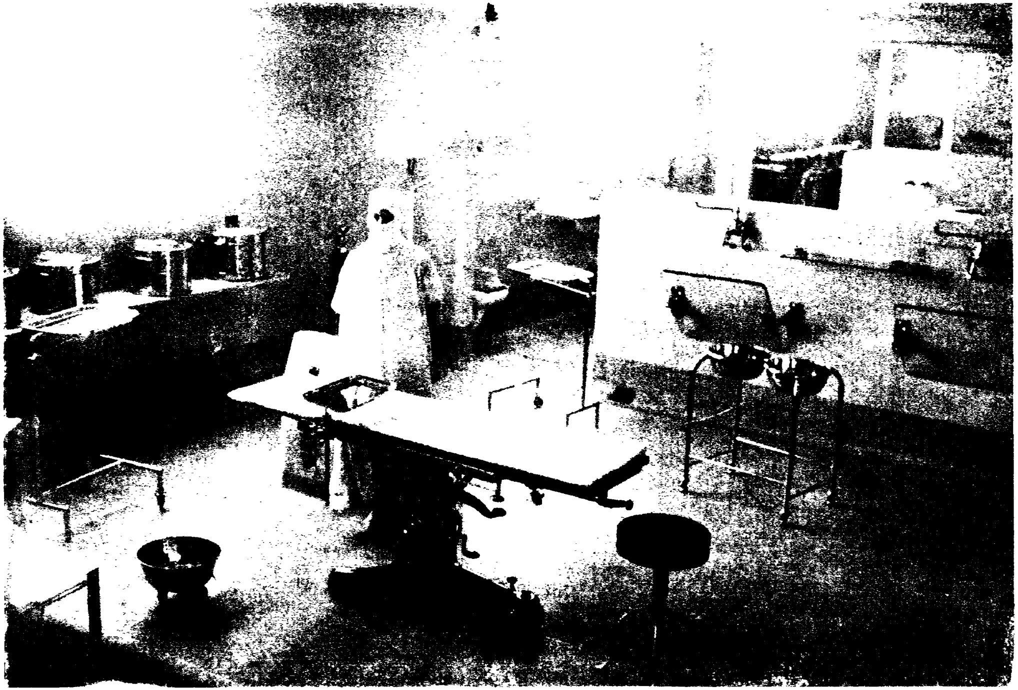
FIG. 169. Daily chart of a case of broncho-pneumonia occurring in an infant 9 months old.

Cause.—Deficiency of food, impure air, cold, damp, rickets (p. 601), diarrhoea are causes. It is often secondary to other illnesses such as measles (p. 333), whooping-cough (p. 354), diphtheria (p. 349), or occurs in those enfeebled by age, paralysis (p. 361), or any other debilitating cause. It may follow the inhalation of ether for anaesthetic purposes (p. 448); or be caused by the entrance into the air passages of food, drink, or infective discharges from the nose, mouth, pharynx, etc., i.e. *septic or aspiration pneumonia.* The organisms commonly found in connection with broncho-pneumonia are the pneumococcus, the streptococcus pyogenes, the staphylococcus aureus, the staphylococcus albus, and Friedlander's pneumobacillus.

Symptoms.—These vary with the cause. In a large proportion of the cases the onset is gradual, the course of the temperature is irregular (see chart, Fig. 169), and defervescence is by lysis (p. 194). Cough is present. The pulse rate is increased and breathing is difficult, rapid, and shallow. The alae nasi move, the accessory muscles (p. 206) of respiration are active, and the lower part of the chest is drawn in with inspiration (p. 206). The patient is restless, anxious-looking, pale and livid, and may suffer from diarrhoea. When death occurs it is usually in the second week. In debilitated adults the symptoms may not be well marked. There may only be pyrexia, cough, shortness of breath, and increase of weakness. Primary cases have an abrupt onset with rapid elevation of temperature, and sometimes terminate by crisis (p. 193). The symptoms very much resemble those of lobar pneumonia. This type of the disease is commonly due to the pneumococcus, and the prognosis is more favourable.

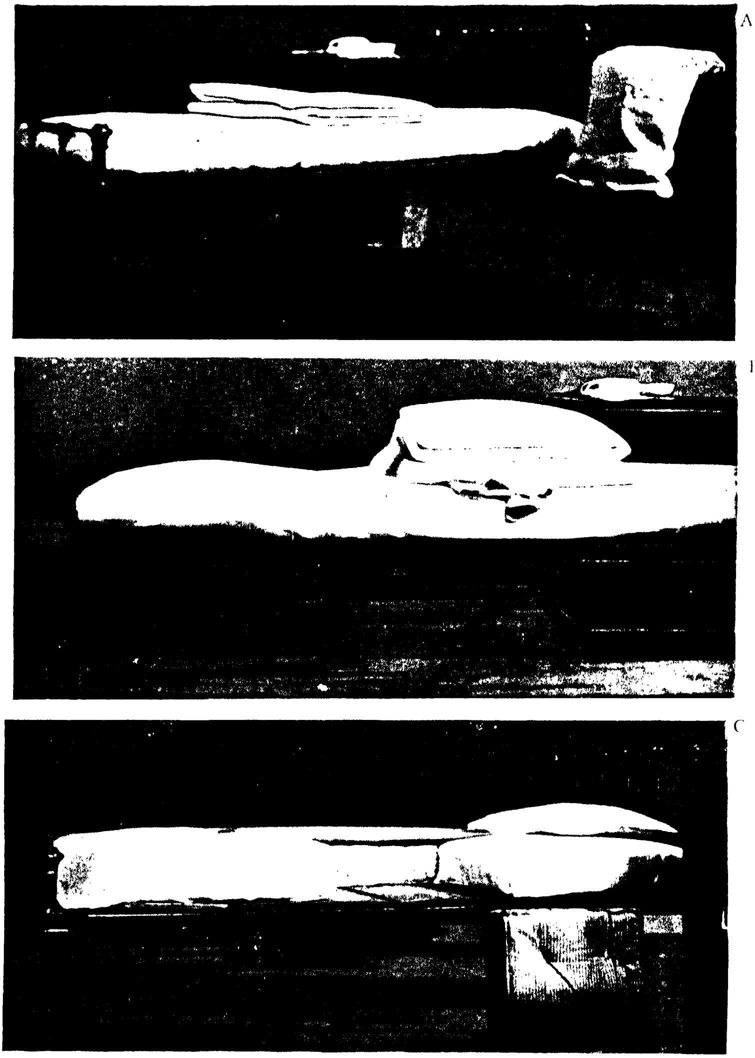
Treatment.—The temperature of the room should be 65° F.-70° F. (p. 7). Thorough ventilation is required, but great care must be taken to avoid draughts. A tent (p. 105) or half tent is a safeguard against draughts and renders efficient ventilation more easy. A steam kettle may be ordered in connection with the tent if there is much dyspnoea (p. 105, Fig. 50). Linseed poultices (p. 91) or antiphlogistine may be ordered for the chest. Abundance of light food must be given. The bowels should be gently moved each day. An expectorant is given, and in cases where the secretions accumulate in the tubes an emetic may be ordered. Infants in this condition should be encouraged to cry, as this greatly helps in getting rid of the secretion by making them cough. Opiates are rarely used. Stimulants are almost always ordered. Stimulating drugs are given internally and hypodermic injections of strychnine (p. 843). Inhalations of oxygen (p. 107) may be ordered to relieve rapid respiration and insomnia. If the temperature is high, or if cerebral

PLATE I



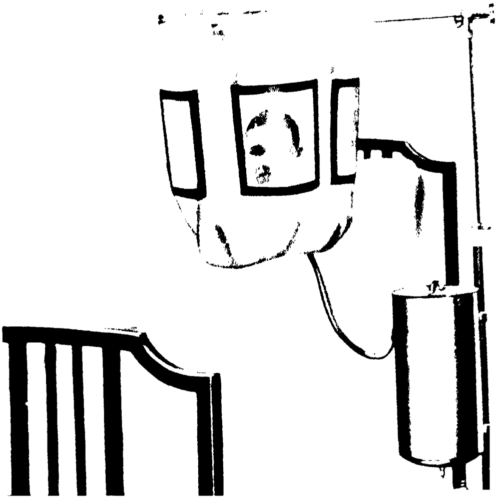
A MODERN OPERATING THEATRE

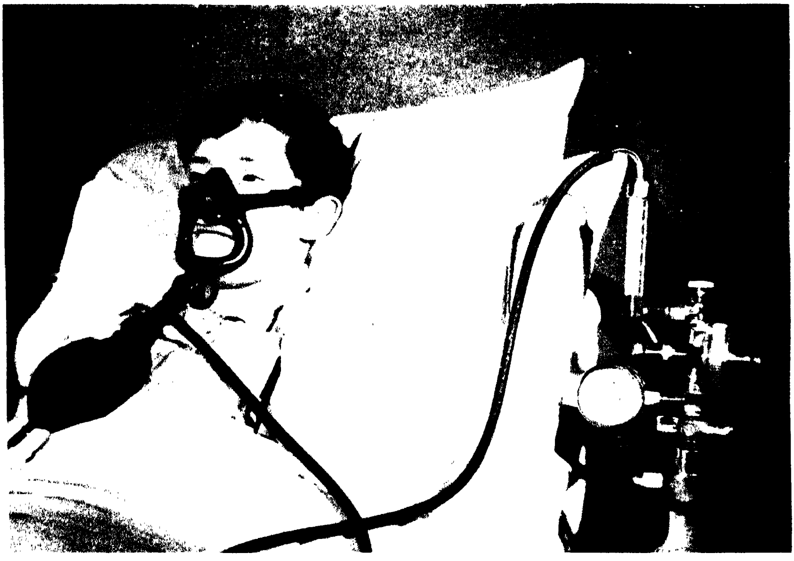
PLATE II · BEDS



A. Bed, showing method of folding the bedclothes on an 'operation bed.'
B. 'Operation bed' prepared, showing hot bottles and inside blanket in position.
C. Bed made with a divided mattress. One half of the middle portion has been removed to show the division and the fracture boards.

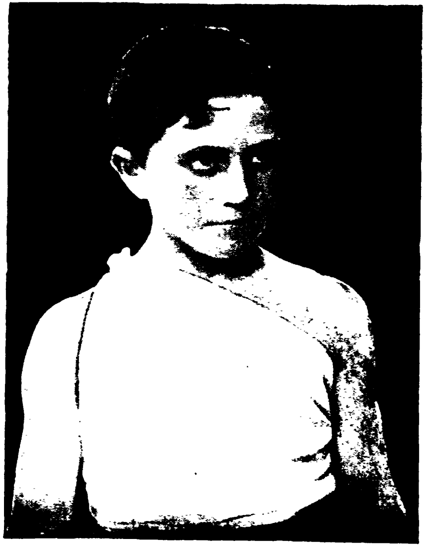
PLATE III • OXYGEN TENT • OXYGEN MASK





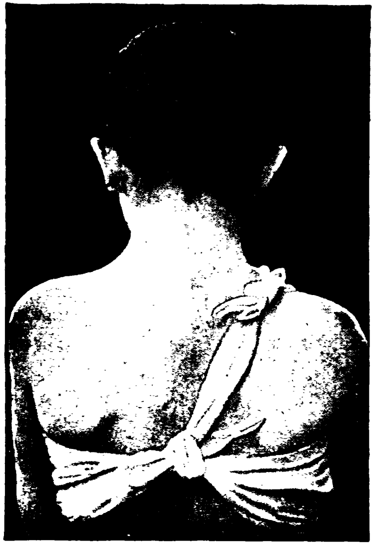
B.L.B. oxygen mask applied.

PLATE IV · TRIANGULAR BANDAGE



A

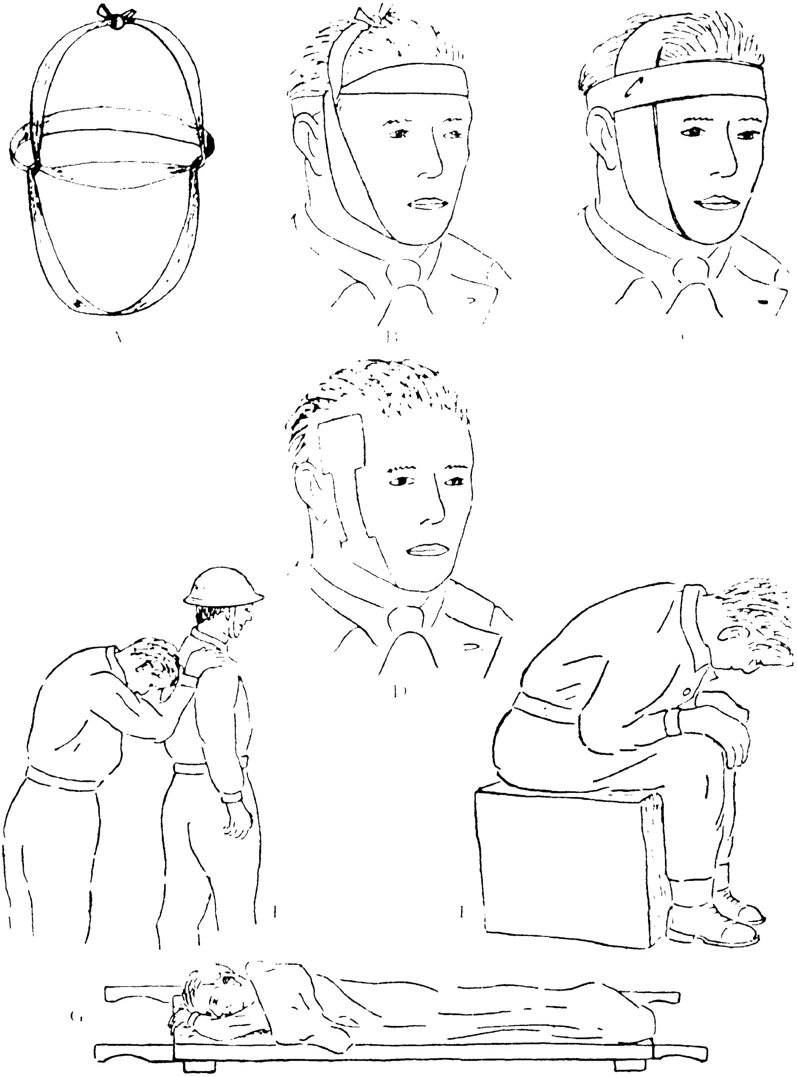
Triangular bandage applied to the chest, front view.



B

Triangular bandage applied to the chest, back view.

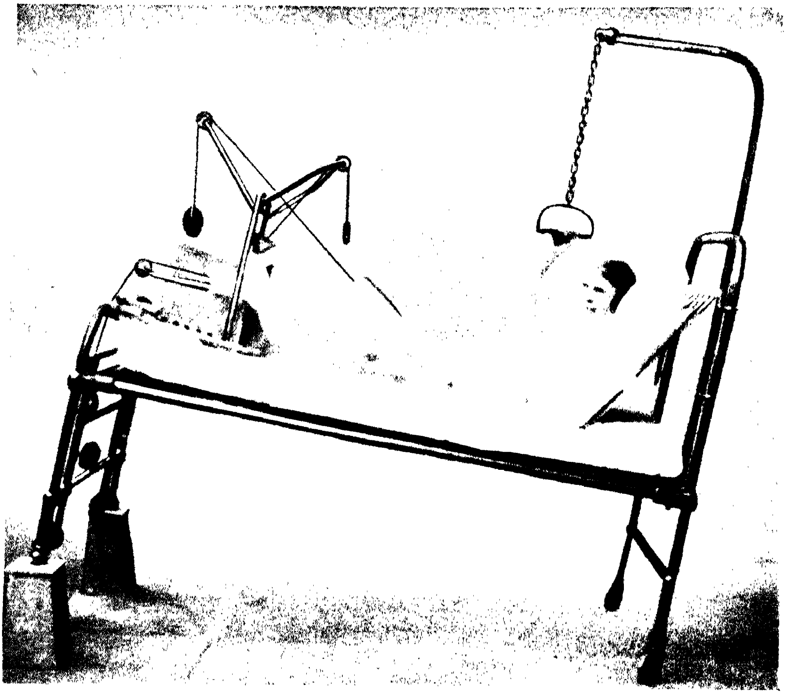
PLATE V · BANDAGES FOR FRACTURE OF JAW



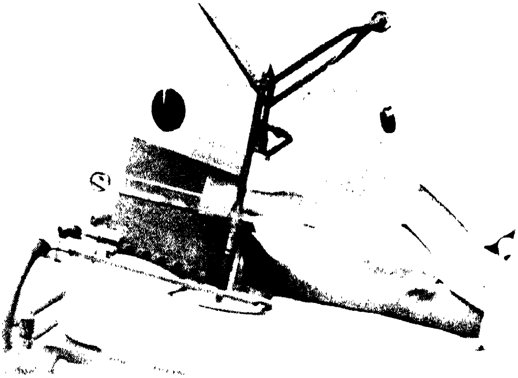
From 'The Dental Treatment of Maxillo-Facial Injuries' (Blackwell).

A. Barrel bandage for fracture of jaw. B. The same applied.
C. Roller bandage. D. Elastoplast.
Positions for fracture of jaw in first aid: E. Walking. F. Sitting. G. Lying.
(*See page* 535)

PLATE VI · EXTENSION



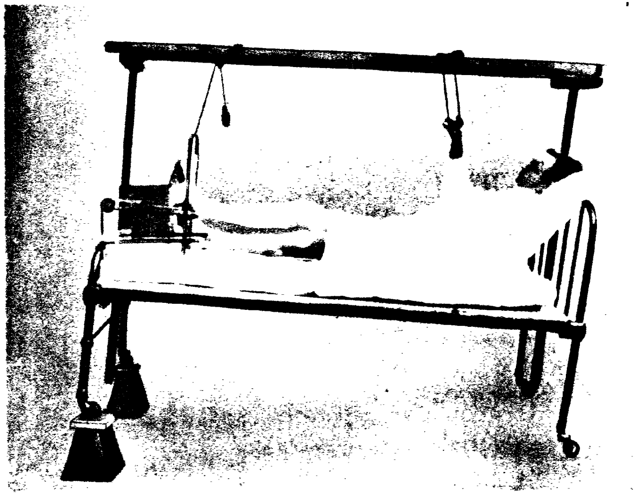
Fracture of the shaft of the left femur treated by strapping extension applied to the thigh and the leg.



Note the wooden callipers fixed to the bottom rail of the bed and the splint. These prevent the splint from moving.

PLATE VII · FRACTURE TREATMENT BY TRACTION · BRAUN'S SPLINTS

A



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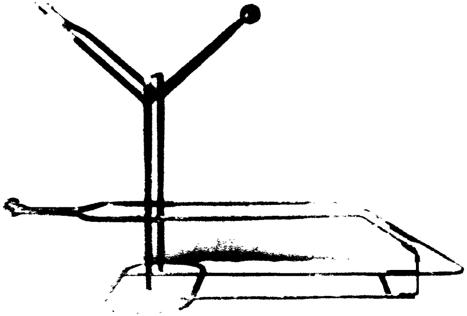
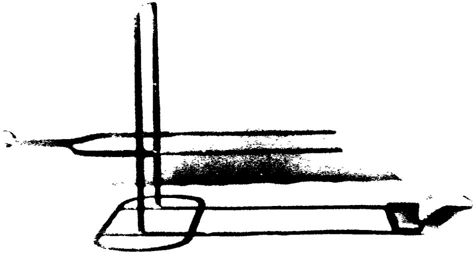


C



A. Fracture of the left tibia and fibula treated by traction through a pin inserted in the os calcis.

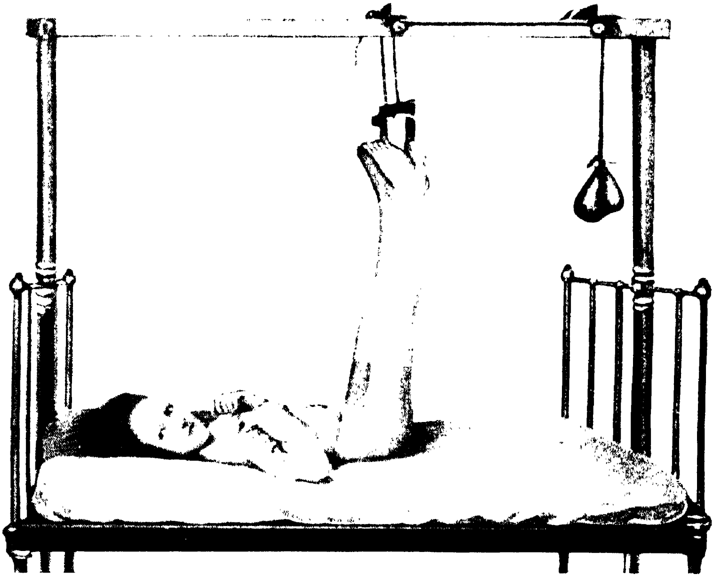
The ankle can be moved from outset by means of the pulley and weight attached to the foot.

Note the box at the foot of the bed and the transverse bar attached to the Balkan beam by means of which the patient can lift himself.

B. Modified Braun's splint for fractures of the femur. The upper end is detachable on the two sides allowing the splint to be used for either leg. The short end does not encroach on the perinaeum, and this facilitates the nursing of a case.

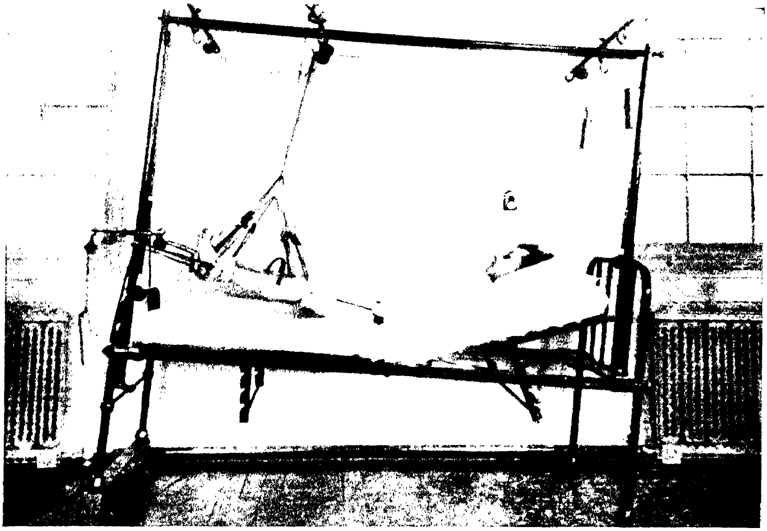
C. Modified Braun's splint as used for fractures of the tibia and fibula; showing method of bandaging the thigh piece. This bandage must and should extend about an inch on to the horizontal bars.

PLATE VIII · BRYANT'S VERTICAL EXTENSION



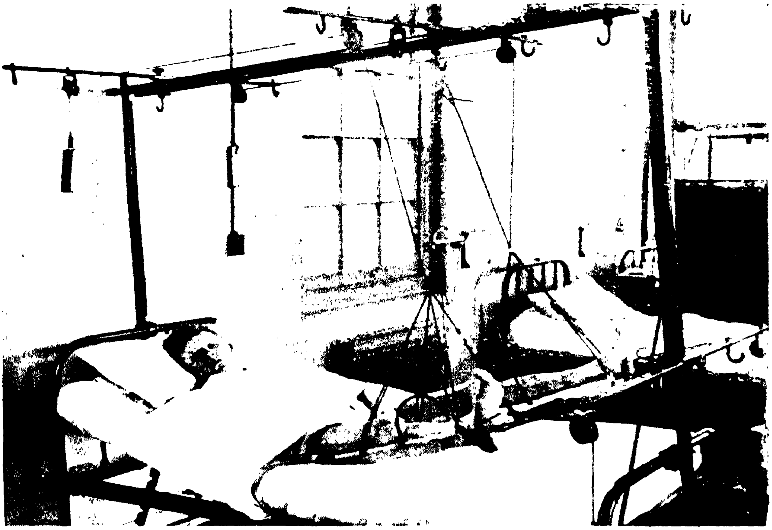
Bryant's extension by vertical suspension.
The right leg is fractured and has the weight attached to it; the left leg is tied up to keep it vertical and out of the way.

PLATE IX · DOUBLE HODGEN'S SPLINTS



A

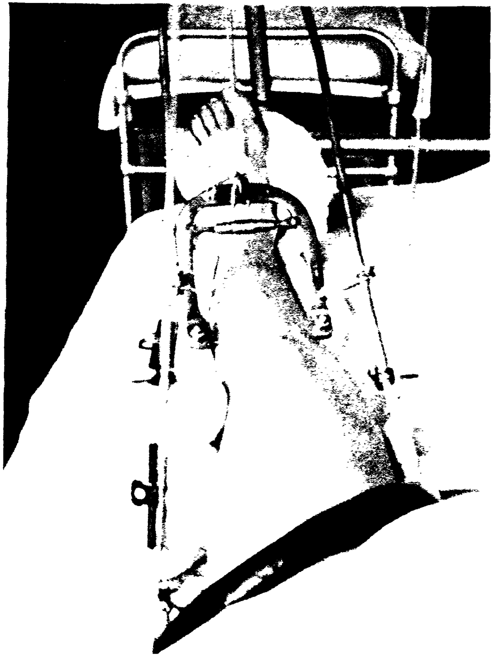
Double Hodgen's splints applied with strapping extension for fractured femur, with Balkan frame. Side view.



B

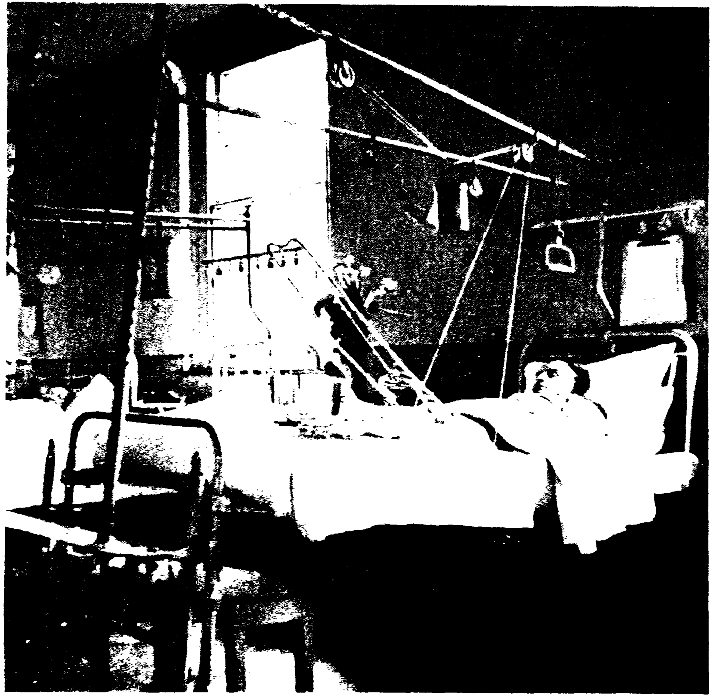
The same. End view.

PLATE X · THOMAS'S SPLIN



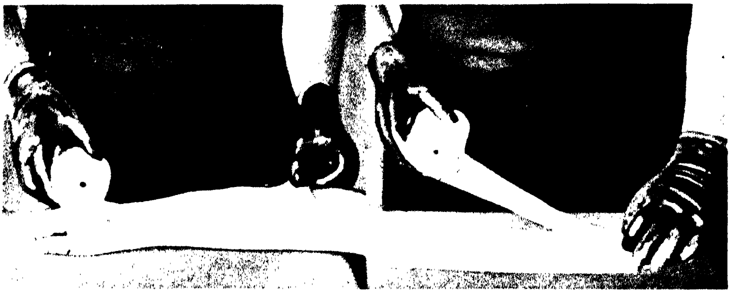
By kind permission of 'Nursing Illustrated'

The leg resting in the Thomas's splint showing wire through the tibia and stirrup attachment.



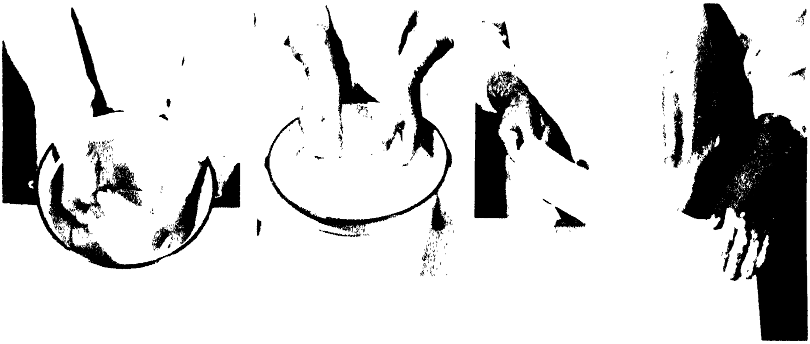
A patient with wire extension through the tibia suspended in a Thomas's splint to a Sinclair fracture frame.

PLATE XI · PREPARATION OF PLASTER SLABS



A. Dry method of preparing Cellona plaster slabs.

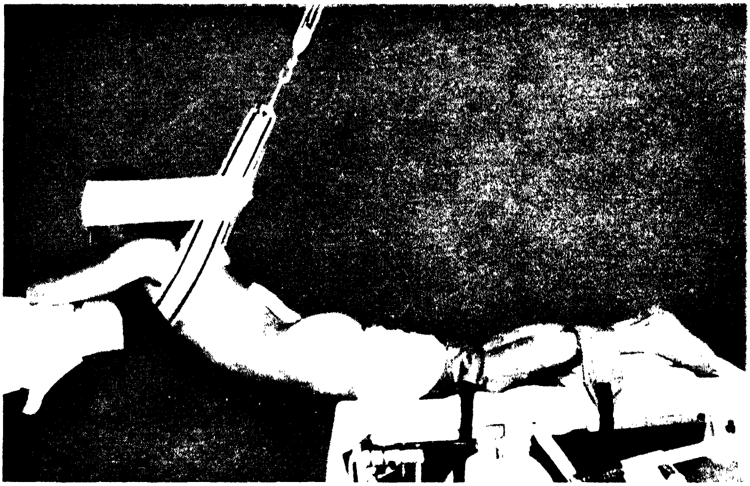
B. Method of strengthening a slab by girdering.



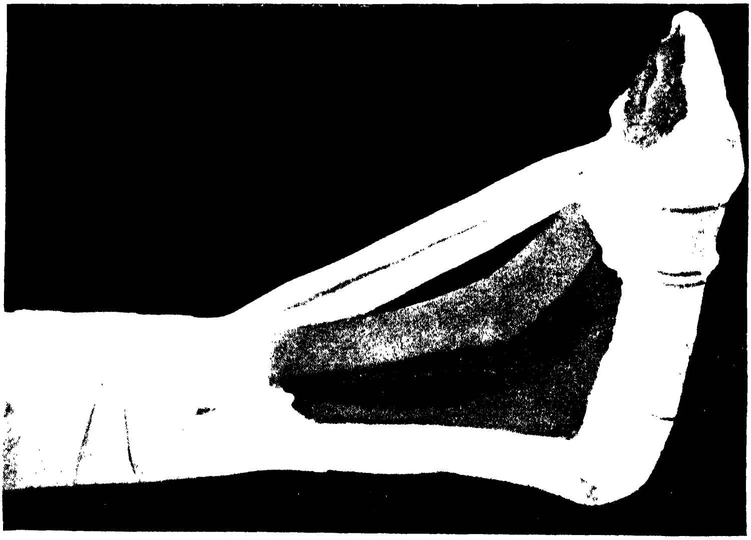
1. Immersion. 2. Removal. 3. Slab making.

C. Wet method of preparing plaster slabs, using Cellona bandages.

PLATE XII · PLASTER JACKET · IMMOBILIZATION

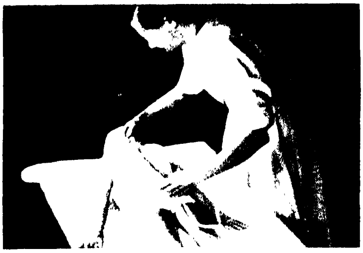


A. Position of patient for application of plaster jacket.



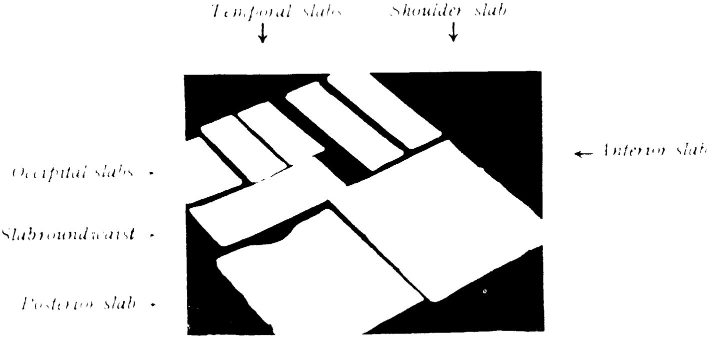
B. The foot is immobilized in a back splint, following operation for drainage of septic bone.

PLATE XIII · FILLET PLASTER



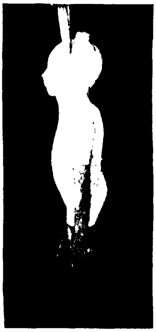
A. Measuring for fillet plaster.

B. Cellona folded into slab.

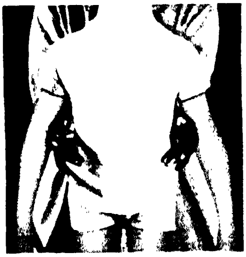


C. Slabs tailored before immersion.

D. Prepared anterior slab.

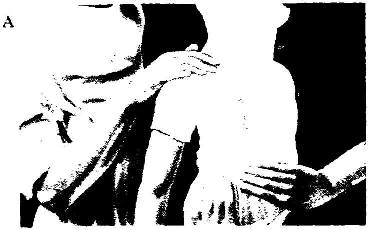


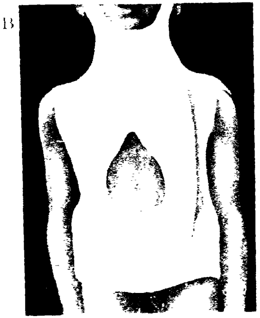
E. Patient suspended.



F. Moulding around pelvic brim.

PLATE XIV
POSTERIOR SHELL


A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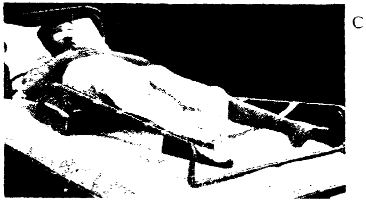
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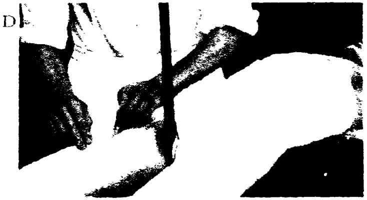
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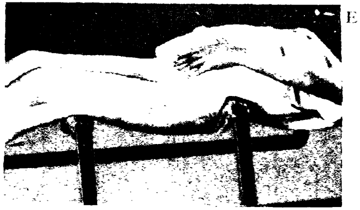
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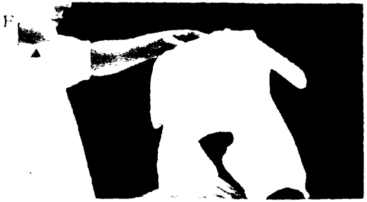
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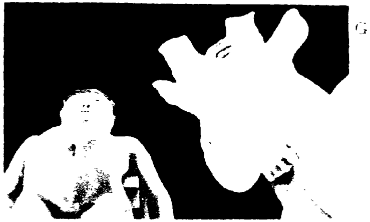

G

A. Application of midget strips.

B. Front view of completed plaster.

C. Completed splint.

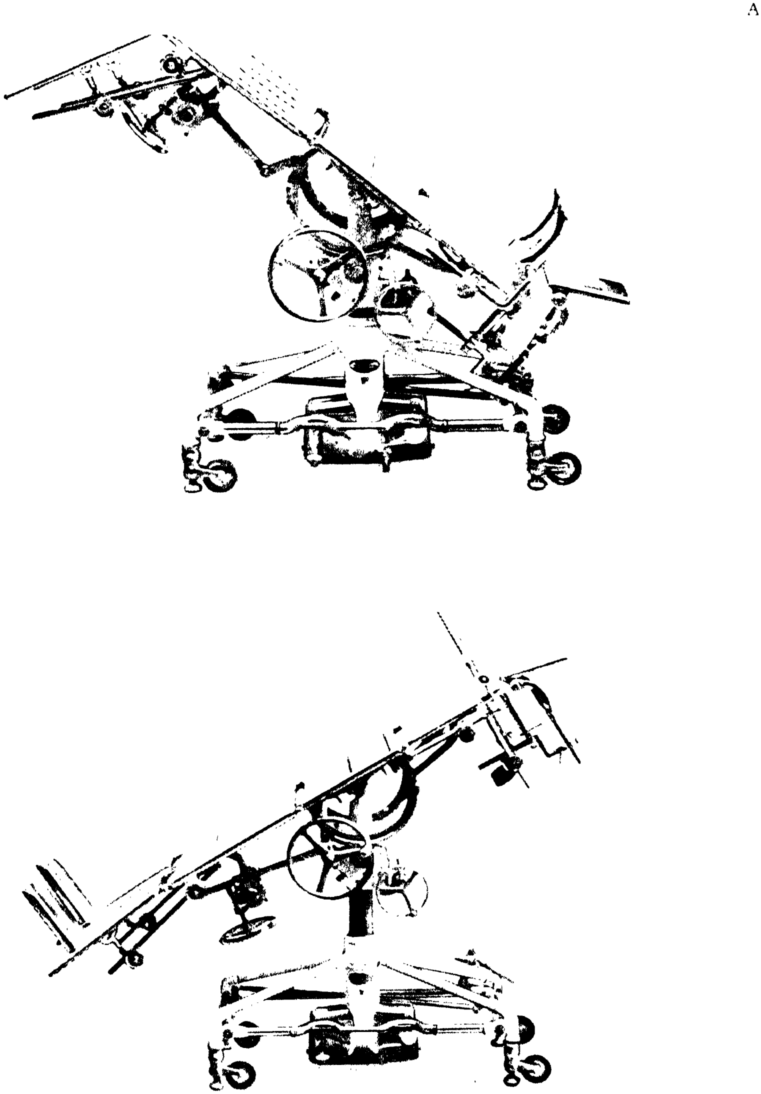
D. Ridging.

E. Completed posterior shell.

F. Completed shell.

G. Inside view of completed shell.

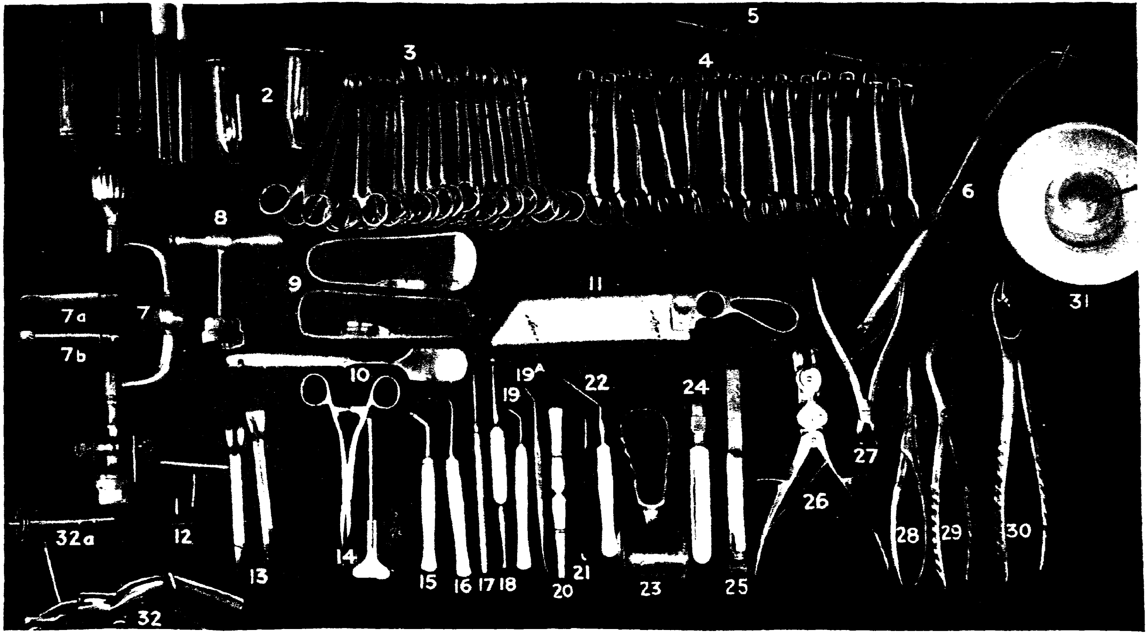
PLATE XV · TRENDELENBURG POSITIONS



Down Bros.

Trendelenburg positions for pelvic operations. A, normal; B, reversed.

PLATE XVI · INSTRUMENTS FOR DECOMPRESSION



1, aspirating syringe and needles and test tubes; 2. saline syringes for spraying trephine while working; 3. Sargent's artery forceps; 4, Sargent's skull-cap forceps; 5. diathermy needle; 6. sucker; 7. trephine (Macewen's); 7a. perforator; 7b. burr; 8. Horsley's hand trephine; 9. glass spatulae; 10. metal spatula; 11. guarded saw; 12. Gigli saws; 13. Gigli saw directors, with whalebone guides; 14, silver wire suture-holder and forceps; 15. dura mater knife; 16. aneurysm needle; 17 and 19. seekers; 18. curette; 19a. probe and dissector; 20. skull elevator; 21 and 22. dura mater separators; 23. mallet; 24. Farabœuf's rugine; 25. chisel; 26 and 27. bone-nibbling forceps; 28 sequestrum forceps; 29. lion forceps; 30. bone-cutting forceps; 31. Horsley's wax; 32 and 32a. Broster electric saw.

symptoms are marked, tepid sponging (p. 111) is prescribed. During convalescence, care must be taken to avoid chills; fattening up, cod-liver oil, and a change of air are beneficial.

3. **Congestion of the Lungs.**—Active congestion is present in the early stages of inflammation (p. 568). Passive congestion is of two kinds: (*a*) mechanical congestion and (*b*) hypostatic congestion.

(*a*) *Mechanical congestion* results from cardiac failure and is characteristically seen in mitral obstruction and mitral regurgitation with failure of compensation (p. 269). It may also accompany an attack of bronchitis or arise in the course of chronic kidney disease or emphysema (p. 191).

Symptoms.—The symptoms are dyspnoea or orthopnoea (p. 205), cyanosis, cough, palpitation (p. 276) with a feeble pulse which may be rapid and irregular. Haemoptysis (p. 259) is common and is generally beneficial. Attacks of bronchitis (p. 248) are common. The treatment consists in treating the heart (p. 265).

(*b*) *Hypostatic congestion* involves the dependent part of the lungs, and is therefore most commonly found at the bases.

Causes.—It results from weakness of the heart, as in typhus (p. 338), enteric (p. 341), and other prolonged and debilitating conditions. It may occur in old people after fractures if kept lying down in bed (p. 533).

Symptoms.—The chief symptoms are great prostration, rapid and shallow breathing with cyanosis.

Treatment.—Preventive treatment consists in changing the patient's position from time to time. The diet should be light and generous. Stimulants and tonics are prescribed. Oxygen (p. 107) is given if cyanosis is present. Linseed poultices (p. 90) or antiphlogistine (p. 103) may be applied to the chest.

4. **Phthisis, or Tuberculosis of the Lung.**—*Symptoms.*—The symptoms are cough and expectoration, haemoptysis (p. 259), loss of flesh, night sweats (p. 188), loss of appetite, gastritis (p. 218). The onset is gradual, frequently with symptoms of an ordinary cold. The temperature is raised and later becomes hectic, intermittent, or remittent (Fig. 161). Dyspnoea is not marked except on exertion. The cough is one of the constant symptoms all through the illness and in the later stages may cause vomiting. The sputum is at first mucous or muco-purulent; later it becomes purulent and nummular (p. 184). Blood may be present in the sputum at any stage. Anaemia is present, the fingers become clubbed (p. 412). In women amenorrhoea (p. 686) is often present.

Treatment.—The general treatment is described under tuberculosis (p. 318). The drugs given include sanocrysin, creosote, cod-liver oil, phosphates, and arsenic. Atropine may be prescribed to relieve the night sweats, and other remedies for the relief of cough and dyspnoea may be required.

Surgical Treatment of Phthisis.—There are three surgical procedures used in the treatment of phthisis when the disease is entirely confined to the lung.

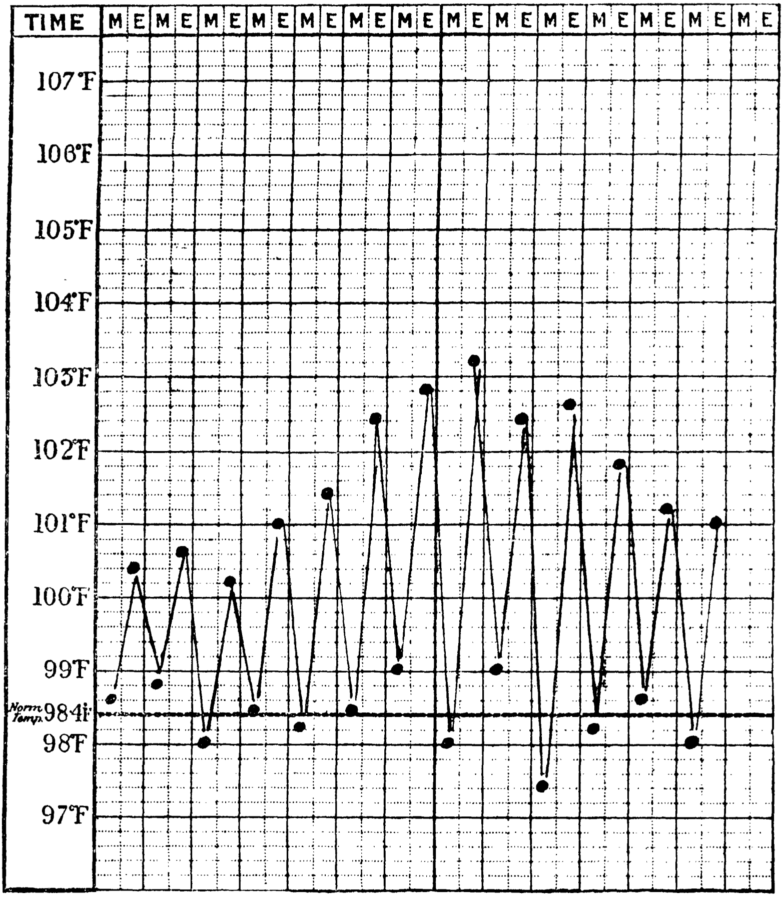


FIG. 170. Chart of a patient suffering from phthisis.

(*a*) *Artificial pneumothorax.*—A trocar and cannula are passed into the pleural cavity on the diseased side, the trocar is withdrawn and the cannula connected to an apparatus through which oxygen is allowed to run into the pleural cavity under very carefully controlled pressure. Enough oxygen is put into the cavity to collapse the whole of the affected lung. The operation has to be repeated often enough to keep the lung collapsed, and the pneumothorax is maintained for many months until the symptoms of active disease have subsided. Frequent X-ray examinations of the chest are necessary to control the treatment.

This method of treatment cannot be used when there are adhesions between the two layers of the pleura.

(*b*) *Phrenic evulsion.*—When the disease is confined to or mainly in the base of the lung the lower part of the lung may be collapsed by paralysing the diaphragm on the affected side. This is done by tearing away the phrenic nerve through a small incision in the neck. The operation may be done under local (p. 444) or general anaesthesia (p. 448). (This operation is also useful in the treatment of bronchiectasis (p. 249) of the lower lobes.)

(*c*) *Thoracoplasty.*—This is a much more severe method of treatment and involves three operations. It is used when the disease is limited to one lung and treatment by artificial pneumothorax is prevented by adhesions. The first operation is a phrenic evulsion (see above); secondly, 4 inches of each of the lower seven ribs are removed through an incision made in the patient's back, the ribs being divided just outside their angles. Thirdly, 4 inches of the 5th, 4th, 3rd, and 2nd, and about 2 inches of the 1st are removed. An interval of about a week is allowed to elapse between each operation; they may be done under local anaesthesia (p. 444) or under intratracheal gas and oxygen anaesthesia (p. 447). After the operation firm pressure is applied to the side on which the operations have been done and maintained for some weeks until the lung has completely collapsed. Post-operative treatment, see p. 461.

5. **Haemoptysis.**—This term is applied to blood expectorated from the lung. The blood is bright red and frothy.

Treatment.—Absolute rest in bed in the recumbent position, or propped up if dyspnoea is so marked as to prevent lying down, is necessary. An ice-bag is applied to the chest (p. 92), ice is given to suck. An inhalation of turpentine sprinkled on lint may be given. A subcutaneous injection of morphia and a cough mixture containing heroin may be ordered. Calcium lactate is given by mouth or by the rectum (p. 60). The diet is restricted to cold liquids in quantities of 3 ounces every 2 hours. The patient should not be allowed to make any effort to move his arms, or to exert himself in any way until all fear of further haemoptysis is past. Everything must be done for him by the nurse, including feeding. For the first 48 hours the nurse should disturb him and move him as little as possible. Cases due to tuberculous disease are treated by the open-air method (p. 319) either at home or in a sanatorium. Haemoptysis occurring in the early stages of phthisis is often fatal. Haemoptysis may occur in any disease of the lung, injury, foreign bodies, etc.

6. **Collapse of the Lung.**—*Cause.*—Predisposing causes are yielding of the chest wall in rickety children (p. 601); weakness of the respiratory muscles. Exciting causes, pressure on the lung from liquid or gaseous accumulations; obstruction of the respiratory tract; prolonged rest in the supine position.

The *symptoms* vary with the cause: Dyspnoea, cyanosis, rapid pulse, restlessness, prostration are commonly present.

Treatment.—Fresh air, good food, stimulants, artificial respiration (p. 549), and oxygen (p. 107) may be required. Any obstruction is removed if possible; the patient's posture is changed if due to the supine position. Later, breathing exercises (p. 752) are given.

7. **Oedema of the Lungs.**—Oedema of the lungs is the presence of serous fluid in the pulmonary tissues and also in the alveoli, and is largely due to the same causes which give rise to congestion. It may also accompany diseases in which dropsy occurs, i.e. Bright's disease (p. 241), heart disease, anaemia (p. 283), etc.

Symptoms.—The symptoms are dyspnoea, cough, with an abundant watery and frothy expectoration (p. 184).

The treatment is that necessary to remove the cause. Local applications are also employed, mustard poultices (p. 92), dry cupping (p. 104), and other forms of counter-irritation.

8. **Acute Suffocative Pulmonary Oedema.**—*Cause.*—The cause is not known, but the condition is thought to be due to an accumulation of blood at high pressure in the pulmonary veins. It is a highly dangerous form of oedema of the lungs.

Symptoms.—The onset is sudden, with great dyspnoea and orthopnoea (p. 205). The pulse is rapid; the surface of the body cold and may be blue or pale; the extremities are cold; there is a great sense of distress and oppression. Cough is present, sputum is brought up with very little effort, and is copious, frothy, white in colour to start with, later the frothy portion becomes pink, or blood may be present (haemoptysis, p. 259). The attack may last from half an hour to several hours. Several attacks extending over a period of months or years may occur, or the first attack may prove fatal.

Treatment.—If cyanosis is marked, oxygen (p. 107) may give relief. Inhalations of chloroform and hypodermic injections of morphia are employed. Stimulants are given either by the mouth, rectum (p. 60), or subcutaneously (p. 82). Heat is applied to the extremities and counter-irritation to the seat of oppression in the chest.

9. **Pulmonary Emphysema.**—Pulmonary emphysema means dilatation of the air cells of the lungs with loss of elasticity, and, later, partial obstruction, which thus interferes with the passage of blood through the lungs and causes congestion of the right side of the heart and of the general venous system.

Causes are chronic bronchitis, senility, inherited disposition, and any condition causing increased pulmonary pressure will have the same effect, i.e. glass blowing, playing on wind instruments, and heavy manual work.

Symptoms.—Chronic bronchitis is usually present; in addition there is dyspnoea, which at first is present only on exertion but later becomes more continuous, and in advanced cases there is orthopnoea (p. 205). Lividity is present and is often associated with pallor. Asthma (p. 249) may co-exist. Owing to the lessened elasticity of the lung, expiration is especially embarrassed. The effect of the loss of elasticity of the lung is to cause the chest to remain always in the position of inspiration; it is therefore barrel-shaped.

Treatment.—This is similar to that given for bronchitis (p. 248). Every precaution should be taken to avoid cold; the clothing should be light and warm. The patient must be propped up in bed, or given a table in front to lean his elbows on in order to assist respiration by using the pectoralis muscles (Fig. 9). In the later stages, when dropsy (p. 191), cyanosis, and orthopnoea are pronounced, the following treatment may be ordered: A mercurial purge, diaphoretics (p. 767), diuretics (p. 767), oxygen inhalations (p. 107), and in some cases venesection (p. 82) followed by cardiac tonics and stimulants. Resection of portions of several costal cartilages is sometimes undertaken.

10. **Pulmonary Gangrene.**—A condition of necrosis of lung tissue followed by putrefaction (p. 828).

Causes are foreign bodies in the bronchial tubes; pressure on the lung by a tumour or aneurysm (p. 278); decomposition of the contents of a bronchiectatic (p. 249) cavity. It may also be secondary to haemorrhagic infarction (p. 282), pneumonia (p. 251), specific fevers, diabetes (p. 289), and other debilitating causes.

Symptoms.—Severe prostration with fever and a rapid pulse; cough; the sputum is extremely foetid as is also the breath. The sputum, on standing, separates into three layers: the upper is frothy, the middle is serous or mucous and comparatively clear, the lower is dense and purulent and has a foetid odour (p. 183). It may be of the prune-juice type (p. 183), and pieces of necrotic lung tissue may be expectorated.

Treatment.—Good feeding and nursing are essential. Stimulants are usually ordered. Antiseptic or deodorant inhalations (p. 106) are given, and a steam kettle containing some antiseptic deodorant is in use continually (p. 105). A tent (p. 105) may be ordered. Abundance of fresh air is needed. In some cases the gangrenous focus can be localized and the cavity drained by surgical means (see operations on the lung, p. 485).

11. **Abscess of the Lung.**—*Causes* are foreign bodies; pneumonia (p. 251); bronchiectasis (p. 249); pyaemia (p. 577); suppuration of a hydatid cyst (p. 227); rupture into the lung of an abscess in some other part, such as an hepatic abscess, mediastinal abscess, perforation of a cancer (p. 314) of the oesophagus.

The *symptoms* vary with the cause. If the abscess does not communicate with a bronchus, the constitutional symptoms of suppuration may be present (p. 569). When an abscess communicates with a bronchus, cough and expectoration are present. The sputum may resemble pus or may be chocolate coloured. It may have little or no odour or be most offensive. It may contain lung tissue, liver tissue, or bile, or food.

Treatment.—If the abscess can be localized, it is treated surgically (p. 464). Otherwise, the administration of nourishing food, stimulants, tonics, together with good nursing and fresh air are the chief lines of treatment (see also gangrene, p. 261).

12. **Tumours of the Lung.**—Tumours of the lung are nearly always malignant.

Symptoms.—The symptoms are pain, tenderness, and cough. Sputum is usually scanty and resembles red-currant jelly (p. 184). Dyspnoea, often in attacks at night, may result from destruction of lung tissue, pleural effusion, pressure on the air passages or nerves. Oedema (p. 190) of the upper part of the trunk and limbs may be caused by pressure on the veins. Pyrexia is of the intermittent type (p. 195).

Treatment.—Radium (p. 730) may be applied with success. Any other treatment is purely palliative. Aspiration (p. 87) may be required if dyspnoea becomes urgent. Stimulants are ordered and the patient is practically allowed what he fancies in the way of food. Morphia may be ordered for the relief of pain and to enable the patient to sleep at night (see nursing of cancer, p. 314).

13. **Pleurisy.**—Pleurisy, or inflammation of the pleura, may be divided into two categories, i.e. dry pleurisy and pleurisy with effusion.

Cause.—The cause as given by the patient is getting cold or wet. Pleurisy accompanies the spread of inflammation either from the lungs or the chest wall, is sometimes due to accidental injury, and is occasionally a complication of rheumatic fever (p. 309), scarlet fever (p. 332), measles (p. 333), etc. It is present in every case of lobar pneumonia (p. 251). The commonest cause is a deposit of tubercle in the pleura. In dry pleurisy, inflammation is present but exudation has not taken place; pleurisy with effusion is the second stage, the inflammation having caused an exudation of a sero-fibrinous fluid, which separates the two layers of the pleura. The fluid is eventually absorbed, but aspiration (p. 87) is frequently necessary. It may become purulent. (See empyema, p. 264.)

Symptoms.—The onset is sudden and characterized by a feeling of chilliness and a sharp stabbing pain in the side. The pain is much increased by drawing a deep breath, coughing, or sneezing, and is frequently referred to the nipple or axillary regions. The temperature rises. The cough is short and sharp in character, and not productive of sputum.

Treatment.—The patient is confined to bed and allowed to maintain the position most comfortable to him. The diet is liquid, and as the fever subsides is gradually increased. Drugs may be ordered for the relief of pain and to enable the patient to sleep. The chest may be strapped (p. 537), or poultices (p. 90), antiphlogistine (p. 103), blistering (p. 95), iodine, leeches (p. 103), or ice (p. 92) may be applied.

Pleurisy with effusion.—At the commencement the symptoms are those of dry pleurisy. The patient at first avoids lying on the painful side, but later when considerable effusion has taken place, preventing the inflamed pleural surfaces from rubbing together, he lies on the affected side in order to permit freer movement of the sound side. The pain is much less severe at this stage. There is moderate pyrexia, which usually subsides by lysis (p. 194) in a week or so, but in some cases continues for several weeks.

Treatment.—Rest in bed is advocated. Liquid diet is given until the fever has subsided, but is then gradually increased, the patient being well fed. A diaphoretic (p. 767) mixture and a laxative are usually ordered, also an opiate if the pain is severe. Poultices (p. 90), leeches (p. 103), an ice-bag (p. 92), or iodine are applied locally. If there is any doubt about the nature of the fluid, the chest is explored. If the serous exudation does not become absorbed, aspiration (p. 87) is undertaken. After the temperature has been normal for a week or so the patient is allowed up. Breathing exercises (p. 752) are given; the patient may blow bubbles or water from a Wolff's bottle, or may practise on a wind instrument if possible. During convalescence, tonics and cod-liver oil are given. A change of air is desirable. Residence in a sanatorium may be advocated.

Empyema is pleurisy with a purulent exudation. The symptoms are those already given but the pyrexia is more marked and is distinctly remittent (p. 196) in type, and the several conditions associated with suppuration (p. 569) ensue.

Treatment.—The pleural cavity is opened and drained by surgical methods (p. 485), after determining the nature of the fluid by exploration.

14. **Hydrothorax.**—Non-inflammatory dropsy of the pleural cavity. As far as nursing is concerned, the treatment is that given for pleurisy. Pain is not a prominent symptom.

15. **Pneumothorax.**—Pneumothorax implies air in the pleural cavity.

Cause.—It may result from perforation of the pleura by a suppurating tuberculous focus at the surface of the lung, or be due to gangrene of the lung, rupture of an empyema into a bronchus, injury, exploratory puncture, extension of ulceration or cancer from the stomach, colon, or oesophagus. The opening may be extremely small, or may be large enough to admit the finger tip. When the perforation takes place, air escapes into the pleural cavity, and is sometimes accompanied by purulent matter. This gives rise to pleurisy with effusion, either serous or purulent; the pneumothorax then becomes a *hydropneumothorax* (serious effusion) or a *pyopneumothorax* (purulent effusion). In the case of wounds (p. 475) of the lung there is usually an effusion of blood with the air, constituting a *haemopneumothorax.*

Symptoms.—The onset may be sudden, or in some cases without definite symptoms. Urgent symptoms are faintness, pain in the chest, dyspnoea, and those of shock (p. 561).

Treatment.—Shock is treated as on p. 561. An opiate may be ordered to relieve both pain and shock. Poultices (p. 90) are applied for the relief of pain. If dyspnoea is urgent an intercostal space may require puncturing for the relief of air at high pressure in the pleural cavity. Aspiration (p. 87) may be required for hydropneumothorax; a pyopneumothorax is treated surgically by opening and draining the cavity (p. 485).

16. **Pneumonokonioses.**—Pneumonokonioses are diseases of the lungs brought about by the inhalation of dust.

(1) *Anthrocosis,* or coal-miner's lung, is due to inhalation of coal dust.

(2) *Lithosis* (silicosis or chalicosis; including stonemason's phthisis, grinder's and potter's rot) results from inhalation of siliceous dust which is very irritating.

(3) *Siderosis* occurs in those who work among oxides of iron.

(4) *Byssinosis* in those working with cotton fibres.

Symptoms.—The symptoms are those of chronic bronchitis and emphysema. The sputum shows colouring due to particles of the material inhaled.

Treatment.—In the early stages a change of work should be sought, and breathing through the nose instituted. For more advanced cases the treatment is that of emphysema (p. 191), chronic bronchitis (p. 248), or phthisis (p. 257).

DISEASES OF THE ORGANS OF CIRCULATION

Diseases of the Heart.—*General nursing.*—It must be borne in mind that with diseases of the heart the whole circulation will be affected, consequently the cerebral circulation is disturbed and the patient becomes uneasy and restless, and may be apprehensive, irritable, despondent, and morose. In the nursing of these cases, patience, tact, conscientiousness, observation, and knowledge of how to act in every emergency are the qualifications required. Certain emergencies may arise in which prompt treatment may be the means of saving the patient's life; it is therefore the nurse's duty to possess a knowledge of such symptoms and to get directions from the physician as to the treatment to be adopted in case they should occur. It is useless to wait for instructions until complications arise, as it will then in all probability be too late. For instance, in aortic disease (p. 271) fainting attacks (p. 276) may occur; the nurse must get instructions as to what stimulants she should give, the quantity, etc. In the event of urgent symptoms appearing when the nurse has not received instructions, she must inform the physician and, meanwhile, apply such treatment as her training and common sense have taught her to be necessary. Treatment as regards medicines, diet, rest, etc., must be conscientiously carried out and must never be omitted or altered by the nurse without instructions from the physician, except in the case of an emergency such as has just been mentioned. Patients taking digitalis require very careful observation, and definite instructions should be obtained as to whether the drug is to be omitted or diminished in the case of unfavourable symptoms arising. If this has not been done and there is, for instance, a sudden drop in pulse-rate in a patient taking digitalis, one dose should be omitted and the wishes of the physician ascertained before the next dose is due. (For symptoms arising due to this and other drugs see Chapter XXVII.) In the general treatment of these diseases, rest, mental and physical, forms an important factor.

Position.—All cases with marked dyspnoea are nursed propped up with either pillows or a bed-rest; cases suffering with orthopnoea (p. 205) are given a 'heart table,' which reaches across the bed, to lean upon (Fig. 9), or may be nursed in an upright arm-chair (heart chair). Cases of pericarditis (p. 274) and myocarditis (p. 273) are usually nursed flat on their backs, but will require to be raised with pillows if dyspnoea is marked. The patient must be spared every exertion, in the acute stage not being allowed to feed himself or perform any act involving muscular exertion. When lifting these patients for the bedpan, bedmaking, etc., the necessary movement should be accomplished without any effort on the patient's part and should be slowly carried out by the nurse and reduced to the minimum. When bedmaking, the patient is to be maintained in the same position, i.e. either propped up or flat, the nurse supporting him if propped up whilst the pillows are attended to, and should not be moved to the bottom or to one side of the bed until convalescent or the physician has given permission (see bedmaking, p. 20). A patient in a critical condition should be warned against making any exertion or sudden movement, as such may prove fatal.

Temperature, pulse, and respiration are taken twice a day, but in cases attended with pyrexia, every four hours. The pulse should be taken frequently in acute cases, in addition to the times it is charted, and should be counted during a full minute (see pulse, p. 200). The bowels are kept relaxed in order to prevent straining, and to relieve the heart and kidneys from work, by eliminating fluids by the intestine. The urine should be measured, a specimen should be tested at least twice a week or oftener; it is frequently diminished in quantity and may contain albumin (see urine testing, p. 35). Warmth is essential and the patient should be protected from draught but must have an abundance of fresh air (p. 6). Bedsores are liable to form, and precautions must be taken in order to prevent their occurrence (p. 17). When permission is given for the patient to move about in bed, etc., it should be done with great caution and very gradually so that the heart has time to accustom itself to the new conditions.

Diet.—The diet is light, chiefly toast, Benger's food, fish, weak tea, bovril, milk and water, etc., but varies according to the condition of the digestive organs. Starchy foods and any foods causing flatulence are avoided. Fluids are usually restricted in quantity. Alcohol is frequently prescribed and is given in small quantities at regular intervals.

Drugs.—Medication forms an important part of the treatment and includes cardiac tonics and stimulants, hypnotics, diuretics, and aperients. Cardiac tonics and stimulants include coramine, camphor, cardiazol, pituitrin, strychnine, strophanthus, quinidine, and digitalis, all of which are in common use. Various preparations of digitalis include digoxin—given either by mouth or intravenously—tincture of digitalis, Nativelle's digitalein, tablets of digitalis folia.

Alcoholic stimulants usually prescribed are either dilute whisky or brandy.

Hypnotics.—Luminal, medinal, chloral, morphia, heroin.

Diuretics.—Salygran, given either intravenously or by muscular injection. Novurit, given either intravenously or as a suppository. Both these drugs have increased effect if ammonium chloride gr. 2 t.d.s. is given for two or three days.

Aperients.—Saline aperients and those producing watery evacuations when dropsy is present (p. 191)—jalap and scammony.

When lividity and dyspnoea are marked, blood is removed by means of venesection (p. 82), 15–20 oz. being withdrawn, thus relieving the distended heart. Leeches (p. 103) may also be applied over the liver.

Exercises and massage (see p. 751) may be ordered during convalescence; aerated and foam baths (p. 115); graduated exercises form an important part of the treatment in some cases. Local treatments include leeches (p. 103), blistering (p. 95), fomentations (p. 90), turpentine stupes (p. 91), inhalation of oxygen (p. 107), ice-bag (p. 92), ice poultice (p. 93), mustard plasters (p. 94), cupping (p. 104), belladonna plasters (p. 94), venesection (p. 82), etc.

The General Symptoms of Heart Disease.—The various symptoms arise from the failure of the heart to pump blood into the organs with sufficient force to return the blood in the venous system back to the heart: this disability of function is described as '*back pressure*,' because, instead of the normal return of the venous blood to the heart for proper maintenance of the circulation, stagnation, or very slow circulation, i.e. congestion, tends to occur in various organs, resulting in impairment of their function owing to their blood supply being deficient.

Respiratory symptoms.—Dyspnoea (p. 205), cyanosis (p. 188), cough, expectoration, haemoptysis.

Alimentary tract.—Loss of appetite, nausea, indigestion, flatulence, constipation, vomiting.

Circulatory system.—The pulse changes, becoming irregular in rhythm, rapid and weaker. Palpitation (p. 276) is often one of the earliest symptoms, but also frequently occurs in persons who have no disease of the heart. Pallor or cyanosis depending on whether the systemic or pulmonary system is most affected. Fainting (p. 276) may occur, but is of comparatively rare occurrence in heart disease.

Cardiac dropsy (p. 191) due to congestion of the venous system.

Nervous system.—Headache, tinnitus (p. 364), sleeplessness, irritability, night terrors, delirium. Pain is variable.

Excretory system.—The urine is diminished in quantity and may contain albumin. The skin is dry and harsh, with a tendency to cracks and fissures.

Facies.—*In mitral regurgitation* (p. 269) the face is broad and ruddy, with dilated vessels in the cheeks and a cyanotic tinge of the lips, ears, and tip of nose. In *aortic* disease the face is long, drawn, weary, and anaemic; the vessels may be seen pulsating in the neck.

Unfavourable symptoms are increasing dyspnoea with cyanosis; rapid small pulse or very slow pulse; temperature below 97° F. or above 103° F.; insomnia, delirium; vomiting; increasing dropsy (p. 191); diminished urine; pain; fainting (p. 276); rigors (p. 207); convulsions (p. 588); unconsciousness.

Cardiac Dropsy.—When a valve is diseased, or prevented by dilatation of the heart (p. 269) from closing the opening it guards, some blood is forced backwards as well as forwards when the heart contracts (see regurgitation, p. 269). As a result, the backward flow of blood meets and obstructs the oncoming stream from the large veins. In consequence a general slowing of the current throughout the venous system takes place (see back pressure, p. 267). In normal conditions the veins and lymphatics drain away from the tissues the fluid which is continually oozing into them from the capillaries: if these drains are partially blocked, an excess of fluid remains in the tissues, causing oedema or dropsy. Cardiac dropsy shows usually first in the feet and ankles, as the heart weakens the dropsy spreads upwards, oedema is seen in the lumbar region (lumbar pad), in the abdominal cavity (ascites), and later in one or both sides of the pleural cavity (hydrothorax).

Treatment.—For the relief of the oedema diuresis is encouraged. If the patient is put to rest in bed with a restricted fluid intake, diuresis occurs without the use of diuretics, and in some patients is very marked, especially if the fluid (limited to 30–40 ounces per day) has a high Vitamin C content (p. 786).

Drugs, Diuretics.—Salygran is commonly used, 2 c.c. is injected: it is given once or twice a week as needed. In female patients it is advisable to pass a catheter half an hour after the injection, leaving the catheter in position, thus sparing the patient the strain of the constant use of the bedpan. Novurit is another drug which is used and is given either intravenously or as a suppository. Both these drugs have a better effect if ammonium chloride, 2 grains, is given three times a day for 2 or 3 days.

1. **Valvular Disease of the Heart.**—A large majority of cases of heart disease come under this heading. The left side of the heart —the *mitral valve*—is most commonly attacked; disease of the right side is rare. Either of the valves may be attacked or the lesions may be combined.

Causes.—Endocarditis (inflammation of the endocardium), the inflammation especially selecting that part of the endocardium covering the valves, results in contraction of the part affected; degenerative changes, most common in advanced life, such as atheroma (p. 202), which cause the valve flaps to become roughened and scarred, or to adhere to one another; rupture of a valve; enlargement of the orifice which the valves should close, so that the flaps do not co-apt and the orifice remains patent (relative incompetency). Two principal effects are brought about in these conditions: the opening of the valve may become more or less obstructed, so that the blood cannot pass freely through it—this is known as ' stenosis ' of the valve; or the flaps of the valve may be unable to close properly, so that the blood, besides flowing along its proper channels, leaks back through the valve—this is *incompetence*, or *regurgitation*, or *decompensation*. As the result of valvular defects certain changes take place in the heart itself. Owing to the extra large amount of blood contained in the chambers of the heart, either on account of the obstructed flow (stenosis), or of the regurgitation of the blood, one or more chambers of the heart may become dilated. In order to overcome this, the muscular wall of the heart tends to increase in thickness. This is known as *hypertrophy*, or *compensation*, or *compensatory hypertrophy*, and is a favourable condition, for if compensation be effective the patient may live the ordinary term of life with little, if any, discomfort.

Dilatation.—Dilatation indicates fatigue of the heart tending to failure. It is always due to failing vigour of the heart muscle (myocardium) and is a serious condition.

Symptoms.—The onset may be gradual, with general impairment of mental and bodily vigour, perhaps fainting (p. 276) and insomnia. Later on, dropsy (p. 268), coldness, and cyanosis of the extremities, great dyspnoea or orthopnoea (p. 205), and enlargement of the liver. In acute cases the heart becomes so distended that muscular contraction can only take place feebly, causing acute cardiac failure (see p. 276). The symptoms are very urgent: orthopnoea, cyanosis, rapid weak pulse, or loss of pulse.

Treatment.—In the early stages the patient should lead a quiet, regular life. Regulated exercise, not sufficient to cause fatigue, should be taken, and a light nourishing diet. Nauheim treatment is given, and is frequently the only treatment that does any lasting good. In acute cases, absolute rest in bed in the propped-up position is necessary. Inhalations of oxygen (p. 107) may be given, intravenous injection of digoxin 1 milligramme or digoxin 1.5 milligrammes by mouth, and venesection (p. 82) may be performed. Aperients, cardiac stimulants, and alcohol are usually prescribed.

Diet.—The food requires to be light and easy of digestion, small in quantity, and given frequently so that the stomach does not become distended.

Mitral Incompetence, Decompensation, Regurgitation.—*Cause.*—Acute or chronic endocarditis.

Symptoms.—The patient is pale and anaemic. The pulse is weak, small, and unequal in force and fullness, and in some cases irregular in rhythm (p. 201); in advanced cases with auricular fibrillation (p. 201) the pulse-wave may not reach the wrist with each pulsation of the heart. Dyspnoea, increased on exertion, or cough, and sometimes haemoptysis (p. 259), is present; palpitation; cyanosis; dyspepsia (p. 218). As the general condition becomes worse the liver enlarges; the lungs become oedematous (p. 260); the urine is scanty and highly coloured; dropsy (see cardiac dropsy, p. 268) begins in the dependent parts; effusions accumulate in serous cavities; quiet delirium sets in and sleep is almost impossible. Pulmonary embolism (p. 282) may occur.

Treatment.—In early cases prolonged rest in bed is given, anaemia and debility are treated, and the bowels are carefully regulated. Later, gentle exercises are gradually introduced. The avoidance of chill is important. In advanced cases, absolute rest in bed and the avoidance of any exertion or sudden movement is essential. When auricular fibrillation (p. 201) is present and is a cause of abrupt heart failure—the pulse rapid, the ventricular rate 150 per minute—digoxin given either intravenously (1 mg.) or by mouth (1·5 mg.) is the most effectual in slowing and strengthening the heart. Light, nourishing diet is given in small quantities. Dropsy is relieved if necessary by tapping the legs (p. 89). Leeches (p. 103) may be ordered to be applied over the liver, and venesection (p. 82) is occasionally required. The drugs ordered include cardiac tonics, stimulants, and aperients; bismuth may be prescribed if there is much sickness. Paraldehyde is often required to promote sleep; if this is unsuccessful, morphia or heroin may be prescribed. The patient is kept in bed for at least six or eight weeks, often much longer.

Favourable signs indicating improvement are: The patient leans farther back on the pillows, the quantity of urine is increased, and sleep without drugs is obtained.

Mitral Stenosis.—*Causes.*—Endocarditis, the result of rheumatic fever, etc.

Symptoms.—Cyanosis is generally present, but there may be nothing else to attract attention, or there may be dyspnoea, with cough and copious expectoration tinged with blood, or with free haemoptysis (p. 259) with signs of cardiac failure. The pulse is small and feeble but regular in the early stages; later it becomes irregular. In long-standing cases the fingers are clubbed (p. 412). When compensation fails the symptoms resemble those given for mitral incompetence (p. 270), but dyspnoea is more marked than dropsy. Embolism (p. 282) may occur in the brain, spleen, kidneys, or frequently in the lungs.

Treatment.—That already given on p. 265.

Aortic Incompetence.—*Causes.*—Endocarditis, atheroma (p. 202), syphilis (p. 322), prolonged and severe strain are the chief causes.

Symptoms.—The symptoms are pallor, faintness, muscular weakness, sense of oppression in the chest, dyspnoea on exertion, paroxysmal dyspnoea, bad dreams, pain in the cardiac region; vomiting may occur and is a bad sign; mental symptoms may be present. The pulse is typically collapsing 'Corrigan's' pulse (p. 202). Pulsation of the capillaries is sometimes present and may be seen under the nails. Sudden death due to syncope following exertion is common; in other cases death may take place from exhaustion resulting from want of sleep, dyspnoea, pain, and inability to take nourishment. Fainting attacks are common and are of serious import (p. 276).

Treatment.—When symptoms arise, rest for some months is required, with careful dieting and avoidance of any sudden movement, over-exertion, mental excitement, etc. The bowels are carefully regulated. The drugs ordered include strychnine, atropine, ammonia, arsenic, morphia, or heroin, to produce sleep. Stimulants are usually ordered. This is the only form of valvular heart disease in which sudden death is likely to occur. It should be understood that treatment is always directed to strengthen the heart muscle. The valve when once injured can never return to the original condition.

Tricuspid incompetence and stenosis, pulmonary incompetence and stenosis are diseases affecting the valves on the right side of the heart. They are rare conditions and will not be described fully here. The nursing in these cases is that already given (p. 265). (For congenital heart disease see Chapter XVIII, p. 606.)

2. **Endocarditis, or Inflammation of the Endocardium.**—There are three varieties of this disease: simple acute, ulcerative, and chronic.

(*a*) **Simple Acute Endocarditis.** — *Causes.* — Acute rheumatism

(p. 309), scarlet fever (p. 332), chorea (p. 389), tonsillitis (p. 669), and some other acute fevers.

Symptoms.—The symptoms are masked by the disease producing the condition. Slight pyrexia, increased pulse-rate, and palpitation may be the only indications.

Treatment.—Absolute rest in bed is essential until the temperature becomes normal, and if possible for six months after this in order to allow the heart muscle to become hypertrophied (p. 269). The cause is treated.

(*b*) **Ulcerative Endocarditis.**—*Cause.*—Infection by any of the following microbes: the streptococcus pyogenes, the diplococcus pneumoniae, the staphylococcus aureus, the gonococcus, the typhoid and influenza bacilli.

Symptoms.—Symptoms are of two kinds; those arising from the heart include those given under valvular disease. The general symptoms include irregular pyrexia, rigors (p. 207), sweating, enlargement of the spleen, haemorrhages into the skin, mucous membranes, and retinae. Embolism (p. 282) of the kidney, spleen, lung, or brain may occur. The course of the disease varies with the type. The following types may be present, i.e. septic, pyaemic, cerebral, typhoid, cardiac.

The *septic type* includes the pyaemic symptoms described under septicaemia and pyaemia (see Chapter XVII).

The *cerebral type* may simulate meningitis (p. 374).

The *typhoid type* is characterized by a continued fever such as occurs in enteric fever. The general febrile symptoms may be the first indication of the disease; the temperature is not so irregular as in the septic type. A dry tongue, delirium, sweating, prostration, and diarrhoea with stools resembling those of enteric (p. 341) may be present, and stupor and coma may supervene before death.

The *cardiac type* occurs in patients the subjects of chronic heart disease. Fever and septic symptoms supervene as a result of the damaged valves becoming the seat of ulceration.

Treatment.—The cause of the infection is removed if possible and vaccines may be given.

Nursing.—Particular care is needed in the nursing of these cases. The patient must be kept at absolute rest either in the recumbent position or propped up if much dyspnoea is present. The nurse should move the patient as little as possible; the use of the bedpan (p. 19), even, may be attended with danger unless the patient is most carefully raised for its insertion. It must constantly be borne in mind that at any moment an embolus (p. 282) may become detached and produce fatal results.

(*c*) **Chronic Endocarditis.**—*Cause.*—May follow the acute form or be caused by frequent strain on the vascular system, such as by blacksmith's work, or by high arterial tension (p. 202), syphilis (p. 322), etc.

Treatment.—In the chronic form the usual treatment for chronic heart cases is given. At any time acute symptoms may supervene in a patient the subject of the chronic condition.

3. **Myocarditis, or Inflammation of the Myocardium.**—(*a*) **Interstitial Myocarditis** follows disease of the coronary vessels with endocarditis and pericarditis.

Symptoms.—The patient may die suddenly in the midst of apparent health, or there may be dyspnoea, palpitations (p. 276), and pain. Angina pectoris (p. 275) is common. The pulse is sometimes irregular and may be either rapid or slow, and swelling of the feet may occur. If the patient rests, recovery or great improvement may take place. Relapses are common, and death may ensue by gradual, rapid, or sudden cardiac failure.

(*b*) **Parenchymatous Myocarditis, or Degeneration of the Myocardium.**—*Causes.*—The causes are acute infections and fevers such as diphtheria, pyaemia, small-pox, etc., or any disease accompanied by prolonged pyrexia.

Symptoms.—The pulse is rapid and soft, with increased rapidity and irregularity on slight exertion. Cyanosis, restlessness, pallor, anxiety, and vomiting may be present. No exertion or sudden movement must be allowed. Sitting up in bed may be the cause of sudden death.

(*c*) **Fatty Degeneration of the Myocardium** occurs in grave anaemia, and poisoning by phosphorus or arsenic (p. 385).

Symptoms.—Symptoms may be absent, or if present resemble those of dilatation (p. 269). Sudden death may occur on slight exertion; the patient is, therefore, kept lying down in bed and at absolute rest. In advanced cases there may be syncopal (p. 276), apoplectic (p. 377), or epileptiform attacks (p. 385), with the addition of angina pectoris (p. 275) but without dropsy. Sudden death may occur due to syncope or rupture of the heart (p. 274).

(*d*) **Fatty Infiltration of the Myocardium** may be a local condition, or part of general obesity. Atrophy may occur in wasting diseases such as phthisis (p. 257).

(*e*) **The Stokes-Adams Syndrome** is the name given to a group of symptoms which include slow action of the ventricle, with syncopal and epileptiform attacks. This condition is known as heart block.

Symptoms.—In the early stages of heart block, symptoms may only be present occasionally, i.e. the ventricle may miss a beat now and then, or frequently and at regular intervals. The seizures are due to cerebral anaemia from the slowing of the ventricular action. When heart block becomes permanent the pulse-rate may be as slow as 20 to 40 per minute, with few or no seizures. In cases where the pulse-rate is extremely slow, 5–30 per minute, the seizures are more frequent. This condition is due to diseases of the myocardium associated with production of fibrous tissue.

Treatment.—When disease of the myocardium is recognized during life the patient should lead a quiet life, with freedom from mental or bodily strain. Exercise should be carefully regulated, with massage (p. 751) if possible. The bowels are kept regular and strict moderation in regard to food and drink must be exercised. Cases due to syphilis (p. 322) or arteriosclerosis (p. 277) are treated for the cause. Cases due to fevers, poisoning, sepsis, etc., are kept lying down in bed at absolute rest for long periods and the cause is treated. (See also nursing of heart diseases, p. 265.)

4. **Rupture of the Heart.**—This is a rare event and may be caused by softening of the myocardium from obstruction of a coronary artery, fatty degeneration, fatty infiltration, abscess, and gumma (p. 323).

Symptoms.—The patient, who may have had no previous symptoms, suddenly complains of intense pain in his heart and dies within a few seconds. In exceptional cases, life may be prolonged for some hours or days.

5. **Pericarditis, or Inflammation of the Pericardium.**—*Causes.*—The causes are acute rheumatism (p. 309), chorea (p. 389), pneumonia (p. 251), scarlet fever (p. 332), or it may follow inflammation extending from other parts, as the pleura, peritoneum, etc., and surgical injuries.

Symptoms.—These vary according to the intensity of the inflammation, hence may be slight or may constitute a condition of utmost peril. The general symptoms are pyrexia (101°–105° F.), with vomiting, dyspnoea, a pinched, anxious expression, and lividity. Pain over the region of the heart is seldom very severe. The pulse is rapid and often irregular. In severe cases, delirium, cough, and painful paroxysms resembling angina pectoris may be present.

Treatment.—The treatment consists chiefly in rest in bed in the recumbent position, or where marked dyspnoea occurs, in the propped-up position (Fig. 11). Treatment is given for the cause. Leeching (p. 103), blistering (p. 95), or an ice-bag (p. 92) or ice poultice (p. 93) over the heart are prescribed in the early stage; later, when effusion is present, counter-irritation may be continued and paracentesis considered. Alcoholic stimulants are ordered from the beginning. Drugs which are cardiac stimulants are also prescribed (p. 768). If the effusion is large, the pericardium may be aspirated. Prolonged rest is necessary after the inflammatory signs have disappeared, and the patient will require to return to the habits of life very gradually. The nurse should protect the patient as far as possible from all anxiety and exertion.

Suppurative Pericarditis is a condition in which the pericardial effusion is purulent instead of serous. The treatment is surgical.

Adherent Pericardium is the condition in which the two layers of the pericardium become adherent to one another or to the chest wall, as a result of inflammation, and follows acute pericarditis.

Hydropericardium, dropsy of the pericardium, occurs as part of a general dropsy. Treatment is given for dropsy (p. 191).

Haemopericardium means blood in the pericardium, and may be traumatic or occur in the course of diseases in which haemorrhages are common. Death usually takes place quickly, with symptoms of rapid failure of the heart.

Pneumopericardium, air in the pericardium, is a rare condition and may be traumatic or result from perforation into the pericardium of a pulmonary cavity, gastric ulcer, or cancer of the oesophagus. In either case inflammation ensues and the symptoms resemble those of pericarditis (p. 274). Death usually takes place within a few days. Surgical treatment may be tried.

6. **Angina Pectoris.**—An acute paroxysm of pain in the region of the heart.

Causes.—It occurs in long-standing cases of gout, diabetes, syphilis, adherent pericardium, lesions of the aortic valve, aortic aneurysm, and sometimes with influenza. The coronary arteries are always the seat of degeneration.

Symptoms.—The onset is sudden and the pain is an intolerable agony, with a feeling of impending death. It is seated at or near the sternum and radiates into the left arm as far as the elbow or the little finger. The expression is anxious, voluntary movement is arrested, pallor and sweating are often present. The pulse may be small or unaffected. Pain may last a few seconds or minutes or may be prolonged over several hours. It often ends with eructation. Sudden death may result during the first attack.

Treatment.—*Angina of effort* may be brought on by walking upstairs, lifting a weight, stooping, etc.; for this an inhalation of nitrite of amyl is effectual, in many cases bringing the attack to an end. Trinitrin (glycerine trinitrate) in tablets is now often used in place of nitrite of amyl. It is very harmless and may be used to prevent as well as to cure an attack. The patient must *chew* the tablet, as the drug is absorbed from the palate, not in the stomach. A number of tablets may be taken without harmful effect. The patient should take them before making any effort, e.g. before going upstairs, dressing, etc. *Nocturnal angina* occurs during sleep, for this luminal (gr. 1) is ordered. *Angina of infarction*, for this absolute rest and morphia are necessary (see infarction, p. 282). In cases which are not relieved by nitrite of amyl or trinitrin, chloroform may be given; chloral is given for the relief of a prolonged attack. During the intervals the patient should avoid mental excitement, severe exertion, or anything that produces an attack. A moderate diet and some regular exercise should be taken, and the bowels carefully regulated. Treatment is given for associated conditions. Latterly, treatment by operation has proved successful in a number of cases (see p. 487).

7. **Palpitation.**—Palpitation is the term applied to the condition in which an individual is conscious of violent beating of the heart.

Causes.—The causes are emotional excitement, indigestion, excessive tea drinking or smoking, neurasthenia (p. 394), hysteria (p. 392), anaemia (p. 283), and some organic diseases of the heart.

Treatment.—The treatment consists in relieving the cause, as, for instance, in cases of indigestion by producing eructation or even vomiting. The clothes should be loosened, the abdomen gently massaged, and a little peppermint water or brandy given.

8. **Syncope, Fainting, or Sudden Cardiac Failure.**—Syncope is a complication which may arise in any case of acute or chronic heart disease. Fainting in connection with heart disease is always a very serious symptom as it is due to sudden cardiac failure.

Symptoms.—Pallor, with lips pale and blue, respiration difficult and shallow, or Cheyne-Stokes's respiration, pulse rapid and irregular, or imperceptible, sweating on brow and face are the prominent symptoms. Unconsciousness may be partial or complete.

Treatment.—The patient is placed flat on his back with the head lower than the body if possible, and turned to one side; the clothing is loosened around the neck and waist; all windows are opened. Cardiac stimulants are given, i.e. coramine by hypodermic injection, and brandy by mouth if the patient is able to swallow. In sudden heart failure occurring in patients with auricular fibrillation (p. 201), when the pulse is rapid and the ventricular rate 150 per minute, the usual heart tonics, coramine, pituitrin, etc., are of little use. Digoxin, 1·5 by mouth or 1 gramme intravenously are the most effectual; strophanthus is also of use if digitalis is not available. Smelling salts or ammonia may be used as an inhalation. Saline, or brandy and coffee may be given by the rectum. Warmth is applied to the extremities, hot fomentations to the praecordium, and oxygen is given nasally (p. 107). The foot of the bed may be raised on blocks.

Fainting is more commonly caused by anaemia, fright, shock, etc., when it is not of such serious import. For treatment of fainting due to other causes than heart disease see p. 547.

9. **Tachycardia,** *or rapid action of the heart.—Causes.*—The causes are similar to those which produce palpitation (see above). Paralysis (p. 361) of the vagus nerve occurs in some cases of neuritis (p. 365) and is a further cause of rapid heart action.

Symptoms.—The pulse may be three of four times faster than normal, reaching in some cases 250 per minute. No symptoms may be complained of, or the patient may be breathless, restless, and greatly alarmed. The condition may be continuous or paroxysmal.

Treatment.—In the simple cases treatment for the cause is necessary. In paroxysmal attacks the patient should rest during the attack. In severe cases cardiac failure may ensue and require treatment. Adequate sleep is most important.

10. **Arrhythmia,** *or irregular and intermittent action of the heart.—Causes.*—The condition may be due to organic disease of the heart or functional causes of the same nature as those producing palpitation (p. 276). The cause is treated. (For descriptions of the pulse in these cases see pulse, p. 200.)

DISEASES OF BLOOD-VESSELS

1. **Diseases of the Arteries.**—*Hypertrophy* of the muscular coat resulting in a thickening of the wall of the artery occurs in conditions associated with high arterial tension (p. 202), such as disease of the kidneys, lead poisoning, gout, pregnancy, constipation, excessive eating and drinking, certain toxic agents.

Atheroma, or Arteriosclerosis, is a condition in which the arteries become degenerate in localized areas throughout their distribution.

Causes.—The causes are the degeneration accompanying old age, high tension of long duration, sudden strains, and especially syphilis (p. 322).

Symptoms.—There may be no symptoms. The effects on the nervous system include loss of power of concentration, loss of memory and judgment, transient attacks of aphasia (p. 364), and paralysis, headache, vertigo, and sickness occur when the cerebral vessels are markedly diseased. Cerebral haemorrhage (p. 377), due to rupture of a small vessel which has undergone degeneration, is a frequent result. If the artery is a superficial one such as the radial, it feels hard, tortuous, and inelastic (p. 203).

Treatment.—The treatment consists in careful regulation of food and drink, which must be moderate in quantity and plain. The bowels are carefully regulated and kept in a slightly relaxed condition. Regular exercise short of producing fatigue should be taken. Alcohol is to be avoided. Various drugs may be ordered. Cardiac, renal, or cerebral symptoms are treated as they arise.

Aneurysm.—An aneurysm is a local dilatation of an artery (Fig. 171). Any artery may be affected. Aneurysm of the thoracic aorta results primarily from some morbid change in the artery which may be caused by syphilis (p. 322), atheroma (see above), toxins, embolism (p. 282), acute fevers, and secondarily from increased tension generally due to powerful muscular action.

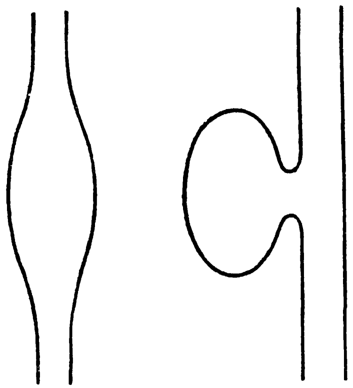


FIG. 171. Two types of aneurysm.

Symptoms.—The symptoms vary according to the part of the vessel affected. If the aneurysm is large and within the thorax, there may be bulging of the chest wall over the seat of the dilatation with pulsation, and on contact with the hand a thrill may be felt. Various local sensations are present, such as pain varying in character and intensity, heat, fullness, weight, or throbbing. The pain may be felt over the front of the chest, down the arm or it may be deeply seated and is often intense. A peculiar harsh metallic cough develops if the aneurysm presses on the trachea and bronchi, and there is much dyspnoea which is aggravated at night. Dysphagia may also be present.

Treatment.—The object is to get the sac filled with laminated clot, and this is encouraged by a slow circulation, a small volume of blood, and low tension (p. 202). The patient remains in bed in the recumbent position for several weeks or months. When much dyspnoea is present the patient is propped up. The diet should be as small as possible and the fluids greatly restricted. Tufnell's treatment may be ordered, and consists in keeping the patient lying down at rest for several months without once being allowed to sit up, and restriction of the diet to 10 ounces of solid food and 8 ounces of liquid in 24 hours. The bowels must be kept regularly moved. Morphia or heroin may be prescribed for the relief of pain and insomnia, and iodide of potassium is the usual drug prescribed. Venesection (p. 82) is sometimes performed. Stimulants are not ordered. Abdominal aneurysm, or aneurysm of the abdominal aorta or of one of its branches, sometimes occurs. The treatment is that just described. Aneurysms affecting other smaller and more superficial arteries are often treated surgically (p. 468). Aneurysms of the arteries of brain, lungs, and kidneys give rise to conditions and symptoms dealt with under diseases of those organs.

2. **Diseases of the Veins.—Varicose Veins, or Varix.**—This term is applied to a condition in which the veins become dilated and tortuous. The veins most commonly affected are those in the lower limbs, scrotum (varicocele), and the veins in the neighbourhood of the anus (haemorrhoids).

Causes.—The causes are excessive standing, strain, any condition which impedes the return of blood from the part, such as constipation, etc.

Symptoms.—The symptoms are aching pain with swelling, sensation of weight, and numbness of the part. The veins stand out and are irregularly dilated and twisted. In the legs the skin over the vein becomes irritated, breaks down, and a varicose ulcer (p. 573) results. The vein may rupture, haemorrhage then takes place, which may be very severe (see haemorrhage, p. 563). Slight haemorrhage often occurs from haemorrhoids (piles), and may be beneficial in some diseases such as cirrhosis of the liver (p. 233).

Treatment.—The treatment of *haemorrhoids* consists in avoiding constipation, bathing with hot water, replacing the pile, and the application of unguentum gallae. Radical cure may be effected by surgical treatment (p. 468), or by treatment by injection. When the haemorrhoids consist of a large mass, surgical treatment by removal of the mass is the most satisfactory. For less extensive haemorrhoids, treatment by injection proves effectual. The injection is given above the haemorrhoid, not into it, the fluid then runs down, surrounds the pile and makes a clot which has the desired effect. The injection is not painful: there is merely a sense of fullness as the injection is made, and there is no bleeding. The patient does not go to bed, and may walk about ten minutes after the injection is given. If there is any recurrence one or more injections are given until cured. For *varicocele*, a suspensory bandage is worn, or surgical treatment is advocated (p. 495).

Treatment.—*Varicose veins in the legs.*—The bowels should be kept freely open to avoid straining at stool. An elastic bandage or crêpe velpeau bandage should be worn and prolonged standing avoided. If no improvement results, treatment by injections usually proves effectual, otherwise the veins may be excised, see p. 468.

Treatment by injections consists in injecting into the vein drugs which cause damage to the endothelial lining of the vein, promoting the production of a firm adherent thrombus and so effecting a cure. The drugs used for the purpose may be one of the following: sodium salicylate, sodium morrhuate, quinine hydrochloride and urethane, lithocaine, or lithocaine and quinine.

Method.—A Record syringe with number 16 needle is used. The injection may be given all in one part in a moderately large vein, or in several small doses along a smaller vein. The skin is cleansed with ether and spirit, the injection is given with the patient standing on a chair. Whilst the needle is still *in situ* a pad of lint or wool is pressed on the vein. The needle is then withdrawn and the patient sits on a high bench beside the chair, raising the leg as he does so. The pad is then bandaged in position and left on for 24 hours. This is done to diminish the risk of leakage from the vein as the solution causes a slough which is slow to separate. The patient is not kept in bed, and may continue his usual occupation, Injections are continued at weekly intervals.

Reaction.—The injected fluids act by causing an aseptic inflammation of the intima—lining of the vein—which causes a coagulation of the blood in apposition to the part of the vein wall affected and so an artificial thrombus is formed. This thrombus adheres closely to the wall and is organized firmly to it by virtue of the inflammatory reaction of the wall.

Complications.—In a properly conducted case embolism does not occur, firstly, because the artificial thrombus remains stationary and does not enter the femoral vein, secondly because the clot is very firmly adherent and is rapidly organized into fibrous tissue.

Some cases do not respond to any solution. Lack of response may be due to changes in the lining of the vein, which accounts for its occurrence when the injection is given too near an ulcer. In these cases the vein is ligatured and divided, using a local anaesthetic. As soon as the wound is healed, the vein usually responds immediately to injection.

Varicose ulcers may be acute or chronic. The *acute* ulcer is small, usually circular in shape, shallow and not raised at the edge. The *chronic* ulcer may be of any size and may almost surround the leg: the edges are hard, sometimes almost cartilaginous: there is a good deal of discharge and a typical foul odour.

Treatment.—The successful treatment of varicose ulcers combine the following: (*a*) treating the casual vein; (*b*) keeping the ulcer under regular treatment; if possible applying firm pressure and not changing the dressing too often, as changing the dressing may injure the extremely delicate new growing epithelium, and so retard healing.

Ambulant treatment.—A recent successful treatment is that of occlusive dressing, using Elastoplast plaster.

Method of application to leg.—Preliminary cleansing of the ulcer is unnecessary, no matter how foul, how deep, or how long-standing. Two 6-inch strips of the Elastoplast bandage are placed longitudinally, one on each side of the leg, acting as splints, from the malleolus upwards.

Elastoplast bandage is then applied spirally, from the toes upwards, enclosing the heel, to just below the knee joint. The pressure should be even and firm over the whole leg, and each succeeding turn should overlap two-thirds of the preceding one. It is advantageous to remove a little of the swelling by rest from a leg which is very oedematous, and in any case it is helpful to apply the bandage with the leg in the horizontal position, using a foot rest. It is always necessary to apply side pieces of elastic bandage, sometimes front and back pieces if there is any risk of the plaster cutting into the leg.

The tightness of the bandage is in proportion to the swelling and induration, but it is always better to err on the tight side. As the oedema is gradually reduced, the degree of pressure required is less.

The bandage must be left in place as long as possible, usually 2, 4, or 6 weeks, and it is a mistake to clean up an ulcer on a leg too effectively between dressings.

Other treatments include Unna-paste dressing (p. 97) or Lassar's paste. Stannard's irrigation envelope with Milton, see p. 101.

Phlebitis, *or inflammation of a vein.*—*Cause.*—The condition may be simple or suppurative. It is caused by direct injury to the vein, by circulating poisons such as occur in gout, typhoid fever, etc.

Symptoms.—The symptoms are swelling and tenderness in the course of the vein, swelling of the limb, pain, and pyrexia which may be slight.

Treatment.—The treatment consists in absolute rest; when a limb is affected it should be elevated on pillows and kept at rest between sandbags, and a cradle should be used. Local applications of glycerine of belladonna, or lead and opium, give relief. The patient must not be allowed to sit up or turn over in bed until the inflammation has subsided.

Thrombosis implies coagulation of blood within a blood-vessel. The clot formed is called a *thrombus.*

Causes.—Thrombosis is associated with phlebitis (see above), arterial degeneration (p. 277), coronary thrombosis (p. 283), enteric (p. 341), infection, endocarditis (p. 269), pneumonia (p. 251), aneurysm (p. 278), prolonged pressure (p. 261), and alteration in the blood causing increased tendency to coagulation.

Symptoms.—The symptoms are local swelling with tenderness along the line of the vessel and evidence that the circulation through the vessel is impeded. Slight or moderate pyrexia may be present.

Treatment.—Absolute rest is essential. When a limb is affected the treatment is that described under phlebitis. The nurse must bear in mind constantly that any movement on the part of the patient may cause the clot, or a portion of it, to become detached with fatal results. Citric acid may be prescribed and is to be taken in a large quantity of water. Light digestible diet of low calcium content (p. 798), avoiding milk because it contains much calcium, and no stimulants.

Embolism is the process in which foreign bodies are carried into the blood stream and become lodged in the smaller blood-vessels, through which they cannot pass on account of their size. The foreign body thus lodged is called an *embolus*. Various kinds of emboli are found. Emboli usually consist of portions of blood clot, or thrombi, or masses of bacteria. Cells from the liver or placenta, masses of tumour cells, fat emboli in fractures of bones (p. 526), air emboli in wounds of large veins, parasites, dust, portions of iron, coal, marble, etc. sometimes produce emboli.

Causes.—The common causes are separation of a part or the whole of a thrombus; laceration of blood-vessels with subsequent detachment of blood-clot; fractures, when fat is absorbed from the marrow; generalized infection such as septic endocarditis (p. 272).

Symptoms.—The symptoms do not become manifest until the embolus reaches a vessel through which it cannot pass, and vary with the position of the vessel in which the embolus lodges. If obstruction is caused in a vital part, such as the coronary arteries or cerebral vessels, death takes place within a few seconds, minutes, or hours. When the occlusion is in a less vital part, the result depends upon the nature of the embolus. If it consists of bacteria or septic material, a new septic focus arises; if aseptic, infarction may take place.

Infarction is the term applied to the formation of an infarct. An *infarct* is a wedge-shaped area of tissue which dies after having been deprived of its nutrition by occlusion of a terminal artery, that is, an artery having little or no anastomosis. The infarct may be absorbed if small, become fibrous and shrunken if larger, liquefy and form a cavity containing liquid, suppurate and cause an abscess, or become gangrenous. Infarction may occur in the lung, brain, kidneys, spleen, intestine, or in a limb.

A *white infarct* results when the area remains anaemic and coagulation necrosis ensues. A *haemorrhagic infarct* occurs when blood from the veins or from capillary anastomosis infiltrates the infarcted area.

Symptoms.—In the lung—the symptoms are severe pain in the side, with haemoptysis (p. 259), cough, and dyspnoea. When one of the large branches of the pulmonary artery is obstructed, the symptoms are very urgent—i.e. orthopnoea (p. 205), cyanosis, terror—and death occurs in a few minutes.

In the heart.—Cardiac infarction may result from coronary thrombosis or embolism. The symptoms include angina pectoris (p. 275), acute pain over the heart, distressed breathing, cyanosis, vomiting, and restlessness. Absolute rest and morphia are necessary. (See treatment for angina, p. 275.)

In the brain—see apoplexy (p. 377).

In the kidney—the sudden onset of albuminuria (p. 236) in a patient suffering from a disease likely to be associated with embolism is strongly suggestive of infarction. Haematuria (p. 237) and pain in the loin may also be present. A septic embolus may be accompanied by a rigor followed in a few days by pyuria (p. 237), or an abscess may develop.

In the spleen—the usual symptoms are sudden pain, tenderness, and elevation of temperature.

In the intestine—the symptoms of infarction are abdominal pain and distension, vomiting, diarrhoea, the stools sometimes containing blood. Perforation may occur (p. 513). Infarction of the intestine is caused by an embolus, or thrombus in the larger arteries lying in the mesentery. Enterectomy (p. 507) may be performed.

Treatment.—The treatment of infarction is by rest in the recumbent position. No movement of any kind by the patient should be allowed, and he should be moved as little as possible by the nurses. In those cases where obstruction in a vital part occurs, nothing can be done. In other areas the treatment consists of rest, good nursing, light diet, the avoidance of stimulants (alcohol, coffee, etc.), and the relief of symptoms as they arise. Recovery much depends on the nursing of these cases. Treatment is given for the cause of the condition when possible.

DISEASES OF THE BLOOD

The nursing is that described under general nursing of medical cases (p. 212).

1. **Anaemia** is a condition in which the blood may be defective in quality or quantity or both. Haemorrhage causes defect in the quantity, but the quantity is rapidly made up by absorption of liquid from the lymph spaces and the alimentary canal so that

the anaemia becomes a qualitative one. Anaemia may also be due to scantiness of red corpuscles or of the haemoglobin, or both, or changes in the white corpuscles.

Chlorosis.—Chlorosis is an anaemia of frequent occurrence in young girls, caused by deficiency in haemoglobin. Predisposing causes are a sedentary life, constipation, bad and insufficient food, ill-ventilated and overcrowded rooms.

Symptoms.—The symptoms are as follows: The face has a greenish-yellow appearance, although the cheeks may be red, or they may be pale and flush too easily. Dyspnoea, palpitation, tendency to faint, slight swelling of the ankles, constipation, gastric and menstrual disturbances, headache, and indigestion are common occurrences. The body is well covered, or may be very fat.

Treatment.—The treatment in severe cases consists in rest in bed with abundance of fresh air and sunlight. The bowels are regulated. Iron and arsenic are the chief drugs ordered. The diet should be light and nourishing, meat is allowed with plenty of green vegetables and fruit. Milk and meat juice should form the chief articles of diet if nausea and sickness are prominent symptoms.

Pernicious Anaemia.—Pernicious anaemia is a severe anaemia which occurs without apparent cause. Lack of the Intrinsic Factor of Castle in the gastric juice, which controls the formation of blood cells in the bone marrow, is now considered to be a cause of the anaemia. It is characterized by a deficiency in red corpuscles as well as in haemoglobin, there is also a diminution in the number of white cells—leucopaenia. It is frequently progressive with temporary improvements. A few cases ultimately recover.

Symptoms.—The onset is gradual. Languor, weakness, palpitation, and dyspnoea are early symptoms. The skin has a lemon-yellow tint, with or without brownish pigmentation. The subcutaneous fat is well preserved in the majority of cases. Swelling of the ankles is present. The pulse is accelerated and soft. Vomiting is frequent. Haemorrhages from the nose, uterus, or other parts are not uncommon. Slight pyrexia is present, either continuously or from time to time. The urine may be dark coloured. Tenderness of the long bones is often present. The nervous system may also be affected.

Treatment.—Rest in bed. Minot Murphy Liver diet is found to be of great value (p. 794). Hygiene of the mouth is important (p. 15); mouth washes should be given at least four times a day, all decayed teeth should be removed and replaced by others if necessary. Fresh air and sun are essential. The drugs ordered include liver extract, ventriculin, hydrochloric acid, anahaemin, which is injected twice a week. arsenic, a preparation of iron, copper, and steel which is given by hypodermic injection, aperients, and intestinal antiseptics. Liver extract is found to be of great value. Transfusion of blood (p. 77) may be undertaken.

Splenic Anaemia.—This term is applied to anaemia with diminution in the number of white cells—leucopaenia; the red cells and haemoglobin are also diminished with enlargement of the spleen.

Cause.—The cause is unknown, but the disease is thought to be due to some obscure infection.

Symptoms.—The onset is gradual, the patient becomes weak and anaemic. Pain or discomfort is felt in the region of the spleen, pyrexia is common, haemorrhages may occur, and the skin may be pigmented.

Treatment.—The treatment consists in rest in bed with nourishing, easily digested food. Iron and arsenic may be ordered. X-ray treatment (p. 726) is given over the spleen. Cases which do not improve under this regimen may be treated surgically by splenectomy (p. 509).

Banti's Disease is a form of splenic anaemia occurring in children. It is marked by enlargement of the spleen with progressive anaemia, followed by hepatic cirrhosis.

Treatment.—Splenectomy produces good results.

Leukaemia is a condition in which there is a persistent increase in the number of white corpuscles in the blood associated with changes in the spleen, bone-marrow, lymphatic glands, and diminution in the percentage of haemoglobin and in the number of red blood corpuscles.

Symptoms.—The onset is gradual with increasing weakness and symptoms of general anaemia, and in addition with enlargement of the lymphatic glands and spleen. Later dyspnoea, emaciation, dropsy, and haemorrhages may occur, and the long bones may become tender. Moderate pyrexia is present in many cases alternating with periods of subnormal temperature.

Treatment.—The general treatment is by rest in bed, fresh air, and good food. Drugs that may be prescribed include liver extract, ventriculin, hydrochloric acid, arsenic, quinine, iron. Inhalations of oxygen (p. 107) and X-ray treatment (p. 726) may be ordered.

2. **Hodgkin's Disease, or Lymphadenoma.**—The term is applied to a disease in which the lymphatic glands and spleen are enlarged and anaemia develops, but without obvious changes being noted in the blood cells.

Symptoms.—Enlargement of a group of superficial glands is usually the first symptom. Anaemia is secondary. There is pyrexia which may be continuous (p. 197), intermittent (p. 195), or irregular. Dyspnoea may be due to the anaemia or to pressure of the glands upon the air passages. Dropsy may also be present and be due either to cardiac weakness, or pressure on veins and obstruction to the lymphatics. The swellings are painless but their pressure may cause serious pain and urgent symptoms.

Treatment.—The treatment consists in rest in bed, with a free supply of nourishing food with extra milk, butter, eggs, etc. The drugs prescribed are arsenic, iron, cod-liver oil, and morphia may be required for pain. In early cases surgical treatment is sometimes undertaken to relieve pressure. X-ray treatment (p. 726) is prescribed. Abundance of fresh air and sun are to be recommended and a change of air when the patient improves.

3. **Polycythaemia.**—Also known as erythaemia, Osler's disease, is due to increase in the number of red blood cells. Over-activity of the bone marrow causes red blood cells to be manufactured at an abnormal rate, the spleen is also enlarged.

Treatment.—Treatment is by X-ray applied to the long bones.

4. **Haemophilia.**—Haemophilia is a constitutional tendency to spontaneous haemorrhages, often congenital and inherited.

Symptoms.—Immoderate bleeding following a trivial injury, and sometimes accompanied by swelling of the joints. The disease may not be discovered until after some wound or operation has been performed, but the haemorrhage may occur spontaneously. The tendency to bleed may not be present continuously and may only last for fourteen days or a month.

Treatment.—The treatment is that given under haemorrhage (p. 563). Persons who have inherited a tendency to this disease or are aware of it should be careful not to incur any wound. Operations are not undertaken during a bleeding period unless absolutely necessary.

5. **Purpura.**—Purpura is a condition in which spontaneous haemorrhages occur in the skin, mucous or serous membranes, and solid organs.

Symptoms.—Petechiae (p. 189), later, haemorrhages of the mucous and serous membranes may result and cause intense anaemia. Pyrexia is usually present. In favourable cases the bleeding ceases in a week or two, and the anaemia gradually disappears. In other cases death may occur within the first few days. Any pressure or injury caused by rough handling is liable to be followed by extensive bruising.

Purpura Rheumatica.—The symptoms are pain and swelling about the joints, purpuric eruptions which appear in crops generally on the lower limbs, and slight pyrexia and sore throat. The attack usually passes off in a few weeks and is rarely fatal.

Henoch's Purpura.—In this condition the early symptoms include arthritis (p. 311) and purpuric eruption with abdominal pain, vomiting, and constipation, later diarrhoea. Intussusception (p. 229) and haemorrhages from the mucous membranes, acute nephritis (p. 241), and enlargement of the spleen may follow. Recurrences and relapses are frequent, but recovery is the rule after a long period. The disease occurs chiefly in children.

Treatment.—The treatment is rest in bed. Salicylates are prescribed for the arthritis, opium for abdominal pain, ergot, calcium chloride, turpentine, or adrenalin for haemorrhages, and tonics for the anaemia and debility. Nourishing and easily digested food in as large a quantity as can be assimilated is essential.

DISEASES OF THE ENDOCRINE OR DUCTLESS GLANDS

In this section are included diseases of the endocrine glands, also those diseases due to disorders of the *internal* secretion of certain external glands (glands with ducts), e.g. the pancreas.

During recent years much research work has been undertaken in the investigation of the endocrine system and its association with the nervous system, together with its effect upon metabolism, resulting in the discovery of the necessity for the perfect regulation of the mechanism by which the hormones (chemical messengers) are excreted into the blood stream.

Nursing.—In the nursing of patients suffering from these disorders of the endocrine system, particularly in disorders of the pituitary and thyroid glands, emotional disturbances, similar to those met with in nervous diseases (p. 357) are common and require tact, patience, and perseverance to overcome the difficulties which arise, bearing in mind that the patient's emotional temperament is only a temporary condition due to disordered metabolism.

The Pituitary Body.—The pituitary body, or gland, lies at the back of the brain and consists of two lobes—a larger *anterior* lobe and a smaller *posterior* one.

1. **Anterior Lobe.**—Seven named varieties of hormones are now known, they exercise a great control in the metabolism and growth of the body: the regulation of the physical activity, and activity of the sex glands. One of these hormones—the *gonadrotropic* hormone—controls the activity of the ovarian secretion and is thought to have influence in the control of the emotions and the control of sleep. Another hormone is concerned with the control of the breasts and secretion of milk, others control the secretions of the thyroid and adrenal glands. The pituitary gland is also

considered by some authorities to produce a hormone influencing the functions of the pancreas and parathyroid glands.

Simmonds's Disease results from degenerative changes taking place in the anterior lobe of the pituitary gland, resulting eventually in deficiency of all the hormones, it is characterized by cachexia (p. 188) and premature senility.

Acromegaly.—The *somatotropic* hormone controls growth. Over-secretion results in gigantism when the condition is present before growth has ceased. Acromegaly results later during middle age.

Symptoms.—Enlargement of the lower jaw and malar bones, the nose becomes broad, the skin thick and coarse, the feet and hands enlarge, the fingers being spatulate in shape.

Under-secretion results in dwarfism or retarded growth.

Cushing's Syndrome, or 'pituitary basophilism' is a rare type of pituitary disorder recently established, so called from the finding of an excess of basophil cells in the anterior lobe of the pituitary.

Symptoms.—Glycosuria, hypoglycaemia (p. 291), associated with painful obesity, red florid appearance, sexual atrophy in both sexes, albuminuria, and hypertension (p. 202). The treatment is as for diabetes, see p. 289.

2. **Posterior Lobe** of the pituitary body produces a secretion called *pituitrin* containing two hormones, vasopressin, which raises blood pressure, and oxytocin, which stimulates contraction of the uterus.

Over-production of pituitrin causes hyperpiesis (p. 203). Pituitrin also influences the metabolism of carbohydrates and fats. If the secretion is excessive an abnormally high percentage of sugar is found in the blood (hyperglycaemia) and sugar appears in the urine (glycosuria).

Under-production of pituitrin causes Frolich's disease and diabetes insipidus.

Frolich's Disease.—If the secretion of pituitrin is deficient, obesity results and the sexual organs become infantile.

Diabetes Insipidus.—A condition marked by persistent polyuria (p. 243), free from albumin or sugar, due to under-production of pituitary, causing the balance of water in the body to be upset.

Symptoms.—The onset is either gradual or sudden, with polyuria and thirst. The general health may be unaffected, or there may be a dry skin, excessive appetite, abdominal pains, general weakness, and wasting.

Treatment.—Pituitary extract hypodermically every 20 hours and tonics are prescribed. Change of air is sometimes beneficial and may be combined with galvanism (p. 741). No change in diet.

Secretions of the Ovaries and Testes.—The ovaries produce two distinct hormones—oestrin or folliculin is thought to control sex development and the activities of the uterus during the menstrual cycle. A preparation of this hormone is used to relieve a number of symptoms occurring at the menopause (p. 687). Progestin is thought to be concerned with the periods of rest of the uterus. An extract of progestin may be prescribed in various uterine disorders.

The testes also produce an internal secretion which controls sex characteristics in men.

The Gastric Secretion.—The Intrinsic Factor of Castle in the gastric juice has lately been classed as a hormone; it has recently been discovered that lack of this hormone may result in pernicious anaemia (p. 284).

The Islets of Langerhans in the pancreas (ductless areas in the pancreas). Scattered throughout the pancreas are small areas which take no part in the formation of pancreatic juice, these are the 'islets of Langerhans,' and they manufacture and pass into the circulation an internal secretion or hormone (insulin). If the secretion of insulin is deficient a condition known as diabetes mellitus results.

Diabetes Mellitus.—A disorder due to deficiency of the internal secretion (insulin) produced by the islets of Langerhans in the pancreas. Insulin is essential for the burning up of glucose in the tissues, e.g. the muscles. If the insulin is deficient, the muscles no longer have the full power of using glucose as a fuel: the result is that it accumulates in the blood (hyperglycaemia), and so passes into the urine. The complete combustion of fats is only obtained when there is free combustion of carbohydrates. When glucose cannot be used as a fuel, the fatty acids, instead of being burnt right up to carbon dioxide and water, remains in a half oxidized condition as diacetic acid and other ketones. These poisonous substances accumulating in the blood result in *acetonuria, ketosis*, or *acidosis*, eventually poisoning the nervous system, causing coma (p. 292).

Symptoms.—The onset may be acute or gradual, with increase in the quantity of urine passed (polyuria), which contains a variable amount of sugar (glycosuria), increase in blood sugar, frequency of micturition, thirst, hunger, muscular weakness, wasting. Loss of weight is most common, although some diabetic patients may be abnormally fat. Polyuria is nature's way of dissolving the excess sugar so that it may be excreted in an attempt to lessen the blood sugar. Normal blood sugar is about 0·1 per cent, in diabetes it may be as high as 0·6 per cent. The urine is pale, acid, and sweet smelling, the quantity may vary from 2–15 pints in 24 hours. Thirst results from the loss of water due to polyuria. Muscular weakness and wasting occur because the sugar cannot be utilized unless insulin is also present in the blood. Sugar which is necessary for the combustion of fats, cannot be stored in the muscles, heat and energy are consequently diminished, causing the patient to be weak and listless. The skin is dry, the temperature subnormal or normal. The tongue is abnormally red, and a sweet taste is sometimes present. Constipation is usual, but diarrhoea may be present. In elderly persons diabetes is often of a mild type and may affect the health very little: it is always more serious in the young.

Treatment.—For purposes of treatment patients suffering from diabetes may be divided into three groups, (1) mild, (2) moderate, (3) severe; in which respectively insulin is unnecessary, optional, and necessary.

(1) In the treatment of mild diabetes occurring in old and middle-aged patients, a qualitative restricted diet is usually sufficient (Lawrence unweighed diet, p. 802). The diet is limited in quantity and most of the foods with high carbohydrate content are avoided. If, with this treatment, the patient's urine becomes sugar-free, the blood sugar is estimated to see that that is also normal. On the other hand, if after two weeks' trial of the treatment the urine is not sugar-free and the blood sugar is above normal, a weighed quantitative diet, and usually insulin, is adopted.

(2) *Treatment of moderate and severe cases.*—Unless there are symptoms of special urgency, the treatment is begun in the same manner as follows. The patient is given a basal diet of 25 calories per kilogram of body weight. A twenty-four hours' specimen of urine is examined for ketone bodies (p. 38). If after a week the patient is not sugar free (that is blood normal and urine sugar free), it proves that the patient's own insulin is insufficient to deal with the minimum of food, and insulin is given. If at the end of a week of insulin treatment the patient is sugar free with no ketosis, the further treatment largely depends on weight and energy. The ideal weight for most diabetic patients is reckoned as 10 per cent below normal weight. When the ideal weight is attained with the patient still keeping to the basal diet, it is necessary to raise the diet again to keep the weight constant. If the patient is much underweight, is lacking in energy and muscular strength, and has neuritis or other complications due to deficient nutrition, the diet is raised from the basal diet to a maintenance diet, 30–40 calories per kilogram of body weight. Some patients refuse the insulin treatment, and for these, diets somewhat below their real weight and energy requirements are given to correct any tendency to hyperglycaemia

(coma) which may prove fatal. Starvation as a preliminary to treatment and desugarizing is now superseded by the methods just described.

Insulin treatment is commenced with a small dose, 5 units half an hour before breakfast and supper, arranging for most food to be given at these meals. A complete twenty-four hours' specimen of urine is tested for sugar and acetone bodies (see p. 38). If after three days' treatment the sugar is not diminished, insulin is increased to 10 units twice daily; if sugar is much diminished, an increase to 10 units before one meal and 5 units before the other will probably suffice. Severe cases may require very much larger doses of insulin. In order to establish the diet and amount of insulin needed, frequent blood and urine tests for sugar are made for about three weeks, raising or decreasing the insulin until the amount of insulin necessary to keep the patient sugar free on a suitable diet is established. At the commencement of this treatment the urine is collected and tested every two hours, later in the treatment the urine is tested before the morning dose of insulin, and again later in the morning when the insulin action is at its highest. At the end of three weeks the patient's diet is established together with the required dose of insulin, and the patient leads a normal life, continuing the diet and the prescribed dose of insulin until symptoms of hypoglycaemia appear, which may indicate a smaller dose of insulin to be necessary due to an improvement in the pancreatic secretion, or until a positive ferric chloride test (p. 39) is present as this is a sign of a dangerous acidosis requiring treatment. The increase in the patient's weight and in the general health is most marked after six to eight weeks' treatment. In cases receiving insulin without adequate control of blood sugar, it is safer to have blood sugar somewhat above normal, with a transient glycosuria, than to have the urine continuously sugar free with a blood sugar at or below normal, as the latter condition renders the patient more liable to hypoglycaemia.

The two chief urgent complications which occur in diabetes are *hypoglycaemia* and *hyperglycaemia*—both lead to coma, which may prove fatal unless immediate treatment is given.

Hypoglycaemia.—The lowering of blood sugar by insulin makes necessary extreme caution in its administration. Insulin when given too long before a meal, or when given in too large a dose, will cause a lowering of blood sugar below the normal level (0·09 %) —a hypoglycaemia. This is to be avoided, as too great a lowering will cause acute symptoms, which, unless quickly relieved, may end fatally.

Symptoms.—Apprehension, i.e. fear of nothing in particular, dizziness, sweating, tremor, intense muscular weakness, difficulty in expressing thoughts and in articulating words, convulsions, delirium, coma. In young children attacks of screaming may be the only early symptom.

Treatment.—The premonitory symptoms are quickly overcome by giving the patient some form of available carbohydrate, preferably sugar ½ oz. in water. Even when comatose, if glucose or sugar can be administered by rectum, by mouth, or by nasal tube, recovery is remarkably rapid. If it is impossible to give carbohydrate in this manner, or the patient is in a critical condition, an intravenous injection (p. 76) of 5–20 grammes of glucose in a 5–50% sterile solution will be necessary. This restores the blood sugar, and the patient recovers and returns to normal usually within 10–30 minutes. Subcutaneous injection of 5–10 minims of 1–1000 solution of adrenalin hydrochloride may obviate the necessity of intravenous glucose injection. If the adrenalin partially restores the patient, carbohydrate is given by mouth. Patients undergoing insulin treatment should always be instructed in the symptoms of hypoglycaemia, and be told to carry sugar in their pockets, in order that they may take it as soon as the first symptom arises, and so prevent disaster.

Hyperglycaemia.—Diabetic Coma.—From the defective metabolism of fat and the resulting accumulation of poisonous acid (ketone) bodies, the condition known as ketosis (acidosis) occurs and may lead to death by coma. Acetone is excreted by the lungs, giving the breath a characteristic sweet smell of new mown hay. These ketones (acetone and diacetic acid) are found in the urine, see p. 38. Dangerous ketosis usually occurs in severe cases of diabetes where the power to oxidize carbohydrate is very low, but a mild case may develop ketosis after great indiscretion of diet, fright, or when sepsis or infections are present.

Symptoms.—The breath and urine have a sweet smell suggestive of apples, chloroform, or new-mown hay. Drowsiness follows with typical respiration which is deep, heavy, and gasping—acetonepnoea (air hunger) (p. 205): the drowsiness deepens into coma unless immediate treatment is given, death resulting in from one to two days.

Treatment.—Immediate injection of large doses of insulin is able to recover most cases. The patient is put to bed and warmth is applied. If coma is not complete, circulatory collapse absent, and the patient can swallow and retain fluids, recovery usually results from the following treatment. If vomiting is likely, the stomach is washed out (p. 64). Insulin 40–50 units is injected and 40–50 grammes of carbohydrate are given by mouth. When this is retained, abundance of fluid is given by mouth—water, tea. The same quantity of insulin is repeated in four hours' time (see chart, p. 294). The essential is to give fixed amounts of carbohydrate at regular intervals and vary the insulin according to the degree of glycosuria present before each dose is due. It may be necessary to pass a catheter to obtain the urine.

Complete coma.—The same principles apply in these cases but, as the patient cannot swallow, the sugar and fluid cannot be given by mouth; also severe cardiovascular collapse and dehydration are usually present causing low eye tension (p. 630) and a shrunken appearance of the face. Intravenous saline three and a half pints with insulin 50 units and glucose 50 grammes is given in the first pint. Heart stimulants may be added to the fluid. Adrenalin 2–3 minims has a beneficial effect on the circulation. If at the end of this treatment the pulse has not recovered, one pint of gum acacia (7 per cent solution) is injected. The treatment is then continued four hourly as given on the chart. If the patient still cannot swallow, saline may be given subcutaneously (p. 82). In favourable cases the balance is gradually restored by the insulin, ketones disappear, the sugar in blood and urine gradually lessens, the patient regains consciousness and later becomes less drowsy.

DIABETIC COMAS

COMPARISON OF HYPERGLYCAEMIA AND HYPOGLYCAEMIA

	Hyperglycaemia	*Hypoglycaemia*
Onset	Gradual	Very sudden
Tongue	Dry	Moist
Respiration	Air hunger, acetonepnoea	Quiet
Pulse	Feeble, rapid, low blood pressure	Normal tension, normal blood pressure
Temperature	Subnormal at first	Normal
Skin	Dry, blue colour	Sweating common
Dehydration	Marked	Absent
Eye tension	Usually low	Normal
Gastric	Vomiting	No vomiting
Nervous system	No pathognomic signs	Convulsions frequent
Reflexes	Usually absent	Normal or brisk
Pupil	Contracted or normal	Often dilated
Laboratory Tests		
Urine sugar	+ + +	Absent or traces
Ketones	+ + +	Absent or traces
Blood sugar	Hyperglycaemia	Hypoglycaemia
Alkali reserve	Very low	Normal

DIET CHART

FOR DIABETIC KETOSIS PRECOMATOSE CASES
TABLE OF EMERGENCY TREATMENT

Diet.—Carbohydrate 40 grammes. Given hourly day and night. The following contain 10 grammes carbohydrate:

Sugar	2 large lumps or 2 teaspoonfuls
Glucose	⅓ oz. or 2 full teaspoonfuls
Bengers	2 level teaspoonfuls
Horlicks	2 heaped teaspoonfuls
Ovaltine	2 very full teaspoonfuls
Orange juice	4 oz.
Milk	7 oz.

Give water between feeds.

Insulin.—Test urine for sugar before each dose (catheter if necessary).

Give four hourly (before food).

40 units if Benedict's test is red or yellow = + + + sugar
30 units if green with copper deposit = trace sugar
20 units if blue = no sugar

N.B.—The quantities of insulin and carbohydrate vary with the requirements of each case.

(From *The Diabetic Life*, R. D. Lawrence.)

Diabetic coma may be confused with the following comatose conditions: uraemic coma (p. 239), cerebral haemorrhage (p. 377), coma of Graves's disease with glycosuria (p. 297), tubercular meningitis (p. 375), insulin coma, and unconsciousness due to overdose of drugs, morphia, etc. Certain other diseases cause a disturbance of carbohydrate metabolism which may closely resemble diabetes. An increased secretion of the thyroid (p. 297) and pituitary glands (p. 287), often produce glycosuria and a temporary hyperglycaemia. Another rare type of pituitary disorder producing diabetes is 'pituitary basophilism' (Cushing's Syndrome, p. 288). The suprarenal gland also has an effect on the blood sugar and an injection of adrenalin (an extract of the gland) causes hyperglycaemia and glycosuria, and is possibly the cause of the glycosuria which may appear temporarily in normal persons under intense excitement, or after accidents, as excitement produces an increased secretion of adrenalin. Disease of the liver may also produce an occasional mild disturbance of carbohydrate metabolism with glycosuria.

Complications.—Acute diabetic abdomen. In states of severe ketosis, before the onset of coma acute abdominal symptoms may develop which are easily confused with acute appendicitis, perforated gastric ulcer, or peritonitis. Vomiting, intense pain, local or general tenderness and rigidity may all be present. Patients in this condition, accompanied by glycosuria and ketonuria, should have a treatment by insulin and glucose as described on p. 290, to see if the condition improves as the glycosuria and ketonuria clear, and so prevent unnecessary operation.

Of the skin.—Boils (p. 413), carbuncles (p. 414), eczema (p. 418), prurigo (p. 420), purpura (p. 286), perforating ulcer (p. 363) and gangrene (p. 573).

Of the lungs.—Pneumonia (p. 251), gangrene, phthisis (p. 257).

Of the urinary system.—Albuminuria (p. 236).

Of the nervous system.—Coma, peripheral neuritis (p. 365), neuralgia (p. 388), tabes (p. 371), paralysis (p. 361), morose or hypochondriacal mental conditions (p. 390).

Of the eye.—Cataract (p. 638).

Education of the patient.—Before leaving hospital or nursing home, it is necessary the patient should be taught the following, or else be dependent on a nurse or capable companion for the rest of his life.

Measure out and inject his own insulin; follow the prescribed diet and work it out either by the Line Ration Scheme or Five-gramme Scheme (see tables, p. 804); test his urine with Benedict's test for sugar and ferric chloride test for ketone bodies; know the symptoms of an overdose of insulin (hypoglycaemia) and the remedy (rest, one or two lumps of sugar, or an orange); must never break the balance of diet and insulin; if ill, or acidosis is present, must inform his doctor; should visit his doctor regularly, taking notes of his diet, weight, and urine tests with him; should always carry a card on his person giving his name and address and that of his doctor, stating he is taking insulin, and that if he is feeling faint or queer he needs two tablespoonfuls of sugar in water to be given to him; he needs also to realize the importance of an ordered regular life such as he has led whilst undergoing treatment, with regular and adequate rest and sleep, regular action of the bowels, care taken of any scratch, abrasion, spot or cut, the part being painted over with iodine; moderate exercise avoiding fatigue, worry, or anything likely to cause shock or fright; avoidance of infections such as colds, influenza, etc.

Zinc protamine insulin has now been available for some time, but is still in the experimental stage, the advantages and disadvantages of its use are:

Advantages.—Its greatly prolonged action, which easily lasts twenty-four hours when given in doses varying in different cases between 20–50 units, so the patient is never entirely out of the influence of insulin, and the completely diabetic condition with heavy glycosuria and ketosis which recurs so frequently before breakfast with soluble insulin is avoided. Its less violent action minimizes the risk and frequency of hypoglycaemia.

Disadvantages.—Its slow entry into the circulation often makes it incapable of preventing hyperglycaemia and glycosuria after carbohydrate meals; the risk of hypoglycaemia at night, or at any time when no carbohydrate food has been eaten for several hours, if too large doses are given.

With careful balancing of diet and insulin, all except the most severe cases can be maintained in good health by one injection a day either of zinc protamine insulin alone, or with added soluble insulin. Soluble insulin can be measured out with the zinc protamine insulin in the same syringe, injected together and yet each retain their characteristic actions, quick and slow, on injection.

Diseases of the Thyroid Gland.—The thyroid gland produces a hormone, thyroxin; lack of this hormone (hypothyroidism) causes myxoedema in adults and cretinism in infants.

Myxoedema is a condition due to loss of function of the thyroid gland.

Symptoms.—The onset is gradual. The skin of the face becomes swollen but does not pit on pressure (p. 190). The lips are thickened and the eyebrows raised. The face is flushed over the cheek bones, the rest of the face being pale. The tongue is large. The hands and feet are broad, the subcutaneous tissue generally is increased, being infiltrated with material resembling the fluid of oedema. The skin is dry and there is little or no perspiration (anhidrosis, see p. 412). The hair becomes scanty. All movements are performed slowly; speech is slow and the voice is thick, thought is slow and the memory is impaired. The patient suffers more in cold than in warm weather, in spite of the increased weight of the body. The temperature is normal or subnormal. In the later stages serious mental symptoms develop. Life may be prolonged for many years.

Treatment.—The treatment consists in good nourishing food, fresh air, and warmth. Thyroid extract is given and must be continued after all symptoms have disappeared. Careful observation of pulse and temperature should be made whilst thyroid extract is being given, as cardiac symptoms and pyrexia may result. The mental condition must be carefully noted.

Unfavourable symptoms include increasing mental dullness ending in coma (p. 360), mania (p. 404).

Operative myxoedema is a condition resembling myxoedema which may follow complete extirpation of the thyroid gland, and occurs occasionally after partial thyroidectomy (p. 482).

Cretinism occurs in infancy or before puberty and is due to loss of function of the thyroid gland.

Symptoms.—The face is dull, heavy, and unintelligent. Bodily growth is greatly retarded. Teething, speaking, and mental development are greatly delayed. The skin is dry and rough, and the hair scanty. The abdomen is large. The tongue may hang from the mouth, and a condition of idiocy is often present.

Treatment.—Treatment consists in attention to hygiene, and physical, moral, and intellectual improvement with the administration of suitable nourishing food. Thyroid extract is prescribed, and during the time it is continued the temperature and pulse should be taken twice daily.

Goitre, or enlargement of the thyroid gland, occurs endemically (p. 330) in certain localities, for which the drinking water has been blamed.

Symptoms.—Swelling in the neck which moves up and down when the patient swallows is the most obvious sign. Symptoms other than those due to the enlarged thyroid are not usual.

Treatment.—Change of locality should be advocated, or all water used for drinking should be boiled. External applications, such as iodine, inunction of biniodide of mercury ointment over the goitre, and internal medication by iodine or potassium iodide, are commonly prescribed. Surgical treatment is undertaken in cases which do not improve.

Exophthalmic Goitre, or Graves's Disease, is a condition in which goitre, exophthalmos, muscular tremor and cardiac disturbances are present, due to abnormal activity of the thyroid gland (hyperthyroidism); the cause is unknown.

Symptoms.—The onset may be sudden or gradual. Palpitation is usually the first symptom followed by enlargement of the thyroid gland: there may be slight exophthalmos and muscular tremor. These symptoms may be classed under three headings, viz.:

(1) Those affecting the *heart*, tachycardia, dyspnoea on exertion, irregularities of the pulse, later auricular fibrillation (p. 201), oedema of the feet and legs due to failing heart, localized patches of oedema.

(2) *Nervous system.*—Fine tremor of the hands and exophthalmos, which may be slight or so great that the eyelids cannot close over the eyeballs, are two of the cardinal signs of Graves's disease. Disturbed sleep, insomnia, flushing, menstrual disorders, irritability, hallucinations, and, later, acute mania may develop.

(3) *Metabolism.*—Hot moist skin, sweating, loss of weight, emaciation, pruritus (p. 417), and in severe cases, pigmentation of the skin. Vomiting, diarrhoea, and albuminuria are grave signs.

Treatment.—Absolute rest, mental and physical, in bed in the recumbent position, as far as possible free from anxiety and worries, is necessary for some weeks or months. The bedclothes should be light, the room airy, the bed being near a window or on a balcony as these patients always feel extremely hot. Investigations are made to disclose any septic focus such as decayed teeth, etc., in order that it may be eliminated.

(1) *Heart.*—A four-hourly chart is kept. Careful note is made of the rate, rhythm, and volume of the pulse: the toxaemia due to over-secretion of the thyroid gland causes rapid and irregular action of the heart, and in some cases auricular fibrillation (*thyrotoxicosis*). An increase in pulse rate is always present, and the slowing of the rate is an important indication of the response to treatment. Breathlessness on moderate exertion, irregularities of the pulse, especially auricular fibrillation, or any evidence of heart failure such as oedema of the legs, are of greater significance than tachycardia. When auricular fibrillation is present, the pulse chart should show both the radial beat and apex beat of the heart, the apex beat being charted in red ink.

(2) *Nervous system.*—Sleep is most necessary, as owing to the derangement of the nervous system the patient is in a state of high nervous tension, being over-sensitive, critical, anxious, and often very frightened. Luminal and bromides are the usual sedatives ordered, heroin and morphia may be necessary. The character of the sleep obtained is important, whether the patient is disturbed or wakened by dreams and nightmare. The patient's tolerance to noise is also an important point for the nurse to note. The manifestations of nervous involvement may range from hyper-excitability to mania. Sweating is often profuse, discomfort from this cause may be relieved by sponging with warm water to which either methylated spirit or eau-de-Cologne has been added, afterwards dusting the skin with dusting powder: this will prove soothing and comforting and often induces sleep.

(3) *Metabolism.*—Most patients prefer the cold to the warm seasons of the year, and all of them will show, in varying degrees, the characteristic hot moist skin. The patient is weighed twice a week. Loss of weight in spite of a good appetite is most significant and the rate of loss of weight is of greater importance than any other single indication of the severity of the disease. The basal metabolic rate (p. 125) is tested at frequent intervals, and is important in that it gives a numerical expression of the state of

the patient's metabolism, but the information may be obtained with greater certainty from a record of the body weight, provided the patient is able to take full diet and is not vomiting. Attacks of diarrhoea, glycosuria (p. 236), and vomiting are grave signs.

Diet.—In compiling the diet the object aimed at is to overcome the wasting of the tissues due to the toxaemia, and is of great importance. Red meat increases metabolism and therefore is not allowed, and fats are given in moderation. The caloric value (p. 787) should be provided mainly from non-stimulating protein—fish, eggs, chicken; and from carbohydrates—milk, butter, and cream, sufficient fresh fruit being given to supply vitamin requirements. *Fluids.*—Since so much fluid is lost sweating and in other ways as a result of increased metabolism, it is important to see the intake is adequate. Fluid can be given as water, glucose water, sweet lemonade, weak tea, at least five pints being taken during the day.

Drugs.—Lugol's solution of iodine acts directly on the gland, diminishing its activity and vascularity. Digitalis is given in all forms of auricular fibrillation, and whenever there is evidence of cardiac decompensation (p. 269). Insulin is given for glycosuria (p. 294). Aperients are given with great caution since there is a tendency to diarrhoea which may be difficult to control, and may cause severe dehydration. Luminal and bromides are given for sleeplessness and excitability. Heroin and morphia may also be needed. Other drugs used include: strophanthus, belladonna, arsenic, and calcium salts. External applications include ice poultice (p. 92), Leiter's coil (p. 93), iodine painted over the gland (p. 95), X-ray treatment, massage, both local and general (p. 749), aerated or foam baths (p. 115).

Unfavourable symptoms.—Progressive loss of weight with emaciation, auricular fibrillation with decompensation, diarrhoea, vomiting, glycosuria, and mental symptoms.

In some cases surgical treatment (p. 482) is undertaken with success, and in others deep X-ray therapy (p. 726) is successful.

The Suprarenal Glands produce two secretions, i.e. *adrenalin* and *cortin*. Deficiency in the secretion of adrenalin causes Addison's disease.

Addison's Disease.—This term is applied to a condition due to disease of the suprarenal bodies, with resulting deficiency of adrenal secretion, and may be due to tuberculosis or cancer.

Symptoms.—Pigmentation of the skin, great muscular weakness, defective circulation, and gastric disturbance are the chief signs. The onset is gradual with increasing weakness and pain in the epigastric region. Extreme muscular weakness is noted, even though the nutrition of the body and muscles appears good. The heart is feeble and the pulse extremely compressible (p. 202). The slightest exertion produces fainting (p. 276) which may prove fatal. The colour of the skin varies from mere sallowness to dark brown or black; pigmentation being specially marked on exposed parts such as the face or backs of the hands, or on parts irritated by clothing, such as the waist, or on naturally dark parts such as the axillae, genitals, nipples, etc. Nausea, vomiting, and diarrhoea may be persistent. Death may be due to heart failure, asthenia (p. 210), diarrhoea, or tuberculous disease elsewhere.

Treatment.—Rest in bed is necessary in all but the very early cases. Food must be light and nourishing, and the patient should be encouraged to take as much as possible. Rectal feeding (p. 60) may be required if the vomiting is persistent and diarrhoea is absent. Fresh air and sun are very beneficial. The usual drugs prescribed are adrenalin, suprarenal gland extract (cortin), tonics, cod-liver oil, bismuth, and opium. Stimulants are commonly ordered. A mustard leaf over the epigastrium may relieve persistent vomiting. Very few cases recover, although a temporary improvement may take place.

Unfavourable symptoms are: Increasing weakness, fainting attacks (p. 276), diarrhoea, vomiting.

The Parathyroid Glands produce a secretion called *parathormone*. Parathormone is concerned in maintaining the calcium content of the blood. Undersecretion or *hypoparathyroidism* causes tetany, osteomalacia, and severe chilblains. Oversecretion, or hyperparathyroidism causes Von Recklinghausen's disease.

Tetany is the term applied to a disease marked by idiopathic muscular spasm due to hypoparathyroidism causing deficiency of calcium in the blood. It occurs most commonly in young children, young adult life, and during the second decade of life. It may occur in epidemic (p. 330) form.

Causes.—Severe diarrhoea, rickets (p. 601), exposure, pregnancy (p. 690), lactation (p. 713), dilatation of the stomach (p. 515), thyroidectomy (p. 482), and acute fevers may be the exciting causes. It may follow an operation for removal of the parathyroid glands.

Symptoms.—The spasm sets in suddenly but may be preceded by tingling or pins and needles in the limbs, and almost always affects both sides of the body. It may be confined to the hands and feet, or the hands alone; it interferes with and prevents movement. The tetany (p. 361) may be continuous, intermittent, or remittent in type, but most commonly it is paroxysmal, the attack lasting during minutes or hours. Sleep may diminish the spasm but does not abolish it. The attack is marked by painful tonic spasm (p. 361) of the hands and feet which may be preceded by tingling or numbness of the part. The fingers are fixed, the metacarpo-phalangeal joints being flexed, and the interphalangeal joints extended; the thumb is adducted and may be flexed; the wrist and elbow may be flexed; the ankle is extended; the foot is strongly arched and turned in; the toes are drawn together and flexed; the knee is usually extended. The spasm may involve the whole limb and in severe cases may spread to the trunk and to the muscles of the face, eyes, tongue, and larynx. Involvement of the muscles of the abdomen and chest may interfere with respiration, and spasm of the abdomen may produce emprosthotonos (p. 584). In severe cases pyrexia may be present with a rapid pulse and profuse perspiration.

Treatment.—The cause is treated and removed if possible. Calcium, parathyroid extract, and drugs consisting chiefly of chloral and bromide are given internally to allay the spasm. Calcium gluconate, given intramuscularly, is prescribed for post-operative tetany. The bowels require to be carefully regulated. The diet should be light and digestible.

Osteomalacia.—Osteomalacia is a progressive softening of the bones leading to serious deformity, caused by hypoparathyroidism (p. 300) and lack of Vitamin D.

Symptoms.—The symptoms include pain in the limbs and difficulty in walking; the deformities of the bones; multiple fractures (p. 527) and bending of the bones may occur. Lime salts which are absorbed from the bones are eliminated in the urine.

Treatment.—The treatment consists in careful attention to diet and hygiene; a diet rich in Vitamin D is essential (p. 784). The drugs prescribed include bone-marrow, phosphorus, and adrenalin which is given hypodermically (p. 84). Oöphorectomy (p. 511) may be performed. Pregnant women suffering from this disease frequently require to be delivered by Caesarian section (p. 511).

Von **Recklinghausen's Disease** or **Osteitis Fibrosa** is considered to be caused by tumours of the parathyroid glands promoting overactivity of the hormone parathormone, i.e. *hyperparathyroidism*, resulting in an abnormally high calcium content of the blood whilst the skeleton is being deprived of its calcium.

Symptoms.—Pain in the trunk and limbs, deformity of the bones resulting in multiple fractures.

Treatment.—The treatment is surgical, the parathyroid glands being removed. The patient is under observation for some time prior to the operation. During this period of rest and investigation, the diet given is of low calcium content, the intake and output of calcium is measured and the calcium content of the blood is estimated. The skeleton is X-rayed to see the condition of the bones.

Post-operative nursing.—In addition to the usual nursing of a surgical case (p. 428), special care and observation are required to detect any signs of tetany which may arise from deficiency in the calcium content of the blood resulting from the removal of the parathyroid glands. Symptoms heralding tetany include: irritability, tingling or pins and needles in the limbs, which precede the spasm, see tetany (p. 300). Calcium gluconate given intramuscularly is prescribed by the physician and is given as frequently as is found to be required to prevent spasms.

Diseases of the Spleen.—*Enlargement of the spleen* may occur in connection with the acute fevers, or in the following diseases: Hodgkin's disease (p. 285), leukaemia (p. 285), cirrhosis of the liver (p. 233), splenic anaemia (p. 285) malarial cachexia (p. 328), lardaceous disease (p. 581). The treatment is directed to the cause.

Infarction of the spleen (p. 285) may result from a simple or septic embolism (p. 282).

Rupture of the spleen may occur spontaneously, or be due to injury. Immediate operation (p. 505) is the treatment.

Abscess of the spleen is also treated surgically.

Movable or floating spleen occurs most commonly in women who suffer from visceroptosis. There may be no symptoms, or the patient may complain of a sensation of discomfort and weight. A specially made belt or corset is worn and the general muscular tone improved, or surgical treatment may be undertaken (splenopexy, p. 510).

GENERAL CONSTITUTIONAL DISEASES

The nursing is that already described under medical nursing (p. 212).

AVITAMINOSIS, HYPOVITAMINOSIS

Avitaminosis.—Any disease caused by a deficiency of vitamins in the diet, such as scurvy, beri-beri, etc.; also called *deficiency* disease and *deprivation* disease.

Hypovitaminosis.—A condition dependent on lack of some essential vitamin from the diet.

Vitamin deficiency causes diseases of many varieties dependent on which vitamin is deficient. Vitamins and their food sources are fully described in tables, see pp. 785–6.

Avitaminosis causes:

Vitamin A. Infections. Eye lesions. Xerophthalmia (dry eye) (p. 633). Keratitis (p. 634). Retarded growth in children.

" *B1.* (Aneurin). Nerve lesions. Poliomyelitis. Multiple neuritis. Beri-beri.

Vitamin B2.	(*a*) (Riboflavine). Skin lesions. Inflammation of the alimentary canal. Diarrhoea. Neural degeneration and lack of growth in animals.
	(*b*) (Nicotinic acid, P.P.). Pellagra.
,, *C.*	(Ascorbic acid). Scurvy. A weakening of the walls of the capillaries.
,, *D.*	(Calciferol). Rickets (p. 601). Softening of the bones. Badly formed teeth and dental caries. Osteomalacia (p. 301).
,, *E.*	(Tocopherol). Uterine. Abortion (p. 705). Sterility.
,, *H.*	(Biotin). Hair and skin affections.
,, *K.*	(Phylloquinone). Prolongation of clotting time of blood with a tendency to haemorrhage.
,, *P.*	(Hesperidin). Associated with capillary fragility.

Beri-Beri.—Due to avitaminosis B1. A condition which is characterized by digestive disorders, followed by progressive anaemia, muscular paralysis, and wasting. The onset may be acute, with symptoms of indigestion. In mild cases the onset may be gradual, with oedema of the shins. There may be slight pyrexia. In the less serious type there is tenderness of the muscles of the lower limbs, with impairment of movement and sensibility. Breathlessness and palpitations may also be present. After a period of days, weeks, or months these symptoms gradually disappear and the patient is completely cured, or the disease merges into another type. In the paralytic form there is rapid wasting of the muscles, loss of power, impaired sensation (p. 363) with the reaction of degeneration (p. 740). Recovery may take several months or death may ensue from heart failure. The dropsical type is marked by dropsy (p. 191) of the subcutaneous tissues and serous cavities, paralysis being absent or slight.

Treatment.—B1 tablets (aneurin) or hypodermic injections of B1 are given. Foods rich in Vitamin B1 are selected, to which Bemax may be added. Fresh air and sunlight are essential. Absolute rest in bed during the early part of the disease or when the heart is affected is imperative. Amyl nitrite is given if the heart becomes suddenly embarrassed, or venesection (p. 82) may be performed. The paralysis is treated as described under paralysis (p. 361). Other symptoms are treated as they arise.

Pellagra.—Due to lack of Vitamin B2—nicotinic acid, also called P.P. (pellagra preventing).

Commonly characterized by dermatitis—blisters on the skin—diarrhoea, and dementia, 'the three D's.'

The erythema develops with symmetrical areas of dermatitis and blisters (*pelle-agra*—rough skin) on exposed parts of the body, the hands, arms, face, neck, etc., and is accompanied with loss of appetite, a raw tongue, diarrhoea, abdominal pain, and loss of weight.

Later severe nervous manifestations may arise, such as spasms, ataxic paraplegia, and mental disturbances which untreated lead to mental deterioration and insanity.

Treatment.—Rest in bed is necessary. The affected areas are covered to protect them from light which is irritating to the condition.

Diet is of paramount importance and requires to be rich in Vitamin B2, consisting of milk, eggs, butter, yeast, marmite, meat, vegetables, and fruit (p. 786). Greenosan tablets (an extract of spinach, fruit, and iron) provide a means of rapidly increasing the vitamin content of the body.

Scurvy, or Scorbutus.—A constitutional condition produced by prolonged deprivation of fresh food, with lack of Vitamin C.

Symptoms.—The onset is gradual with loss of bodily and mental strength. The skin is pale and sallow. The gums are swollen, spongy, painful, and bleed easily. The teeth are loose; the breath is offensive. Petechiae (p. 189) and large ecchymoses (p. 563) develop in the skin; firm swellings appear in the calves due to haemorrhages into the muscles. There is dyspnoea, palpitation (p. 276), and oedema (p. 190). The temperature is subnormal.

Treatment.—In the treatment diet is most important and should consist of food rich in Vitamin C (p. 786), fresh vegetables, fruit, fresh meat juice, lime juice, or lemon juice, with glucose. The food should be soft while the gums are painful, e.g. egg-flip (p. 817), bread and milk, mashed potatoes and other vegetables, stewed fruit or soft fruit, etc. Frequent antiseptic mouth washes must be used. Synthesized Vitamin C (ascorbic acid) may be prescribed.

Complications which may ensue are pneumonia (p. 251), gangrene of the lung (p. 261), pleurisy (p. 262), pericarditis (p. 274)—the effusion into the pleura and pericardium may be haemorrhagic—diarrhoea, dysentery (p. 224). Death may result from exhaustion, heart failure, haemorrhage, or one of the complications unless prompt treatment is given.

ALLERGIC DISEASES

Allergy.—The term ' allergy ' indicates an altered reaction in man to foreign proteins, or hypersensitiveness to proteins. Certain diseases are now known to be caused by this condition and are called ' allergic diseases.' These different diseases are but *symptoms* depending on the same underlying ' allergic state.'

This state may be induced in most of the structures of the body, the most easily observed being the skin, and it is in the skin that reactions to the different proteins are usually tested (p. 127).

There is a marked difference of opinion amongst physicians as to which diseases owe their origin to protein hypersensitiveness, but it is agreed that this state is more important than was at one time supposed.

The wall of all cells consists essentially of a membrane which is semi-permeable, that is, it will allow *crystalloids* but not *colloids* to pass through it. A crystalloid, such as salt, will enter or leave a cell according to the laws of osmosis (p. 783). A colloid, for instance a protein molecule, is unable to pass a semi-permeable membrane, owing to its size. It is necessary for a protein to be broken down into its constituent amino-acids and carbohydrates before absorption can take place through a *normal* mucous membrane. When, however, a protein is introduced into man parenterally, that is, by a route other than the alimentary canal, e.g. by subcutaneous injection, the tissues have to deal with what is to them 'a foreign protein.' To deal with foreign proteins the tissues produce *antibodies* (p. 834), the function of which is to 'digest' the protein into simpler molecules that are diffusable and therefore able to pass a cell-membrane. A substance which is capable of giving rise to antibodies of this nature is known as an antigen (p. 834). The injection of an antigen gives rise to sensitization after an interval of ten days or more.

Allergy is probably a protective mechanism and is allied to immunity (p. 835). There are three possible states:

(1) *Normal*, in which there are no antibodies.

(2) *Sensitization*, in which antibodies are fixed in the tissues.

(3) *Immunity*, in which antibodies are free in the circulation. The second state constitutes Allergy.

Bacterial allergy may be treated in three ways:

(1) If dependent on focal sepsis, the infected foci may be removed surgically.

(2) The use of autogenous vaccines may lead to improvement.

(3) Non-specific vaccine therapy is much used.

Desensitization.—Sensitization consists essentially of antibodies in the tissues and differs from immunity, as in the latter condition antibodies are present in the circulation. Desensitization is brought about by injections of the pollen (in asthma), or other particular protein, to which the patient is sensitized. The injection of the pollen or particular protein will alter the reaction to such a protein so that inhaling the pollen or consuming the particular protein no longer produces effects. On inquiry from the patient it may be found certain foods or animal emanations are suspected as a cause. These should first be tested. The following types of protein are then tested:

Food.—Milk, eggs, fish, pork, beef, mutton, wheat, barley, oats, nuts, etc.

Epidermals and inhaled antigens.—For example, feathers—fowl, duck, or goose.

Hair.—Rabbit, dog, cat, horse.

Pollens.—Timothy grass, orchard grass, and orris root, which is the basis of face-powders, should be included.

Foods are of especial importance in infancy and youth, and inhaled antigens in adolescence and adult life.

Method.—The pollen or other protein causing the condition is first ascertained by means of skin tests, of which there are several methods, but they all consist of applying a solution of pollen or other protein to epithelial structure (see precipitin, p. 835).

Protein skin test.—See p. 127.

Method 1.—Having ascertained that a particular protein gives a positive skin test, and having found out the lowest dilution in which such a reaction is given, attempts at desensitization are made by injecting a solution one hundred times weaker than the weakest which gave a positive skin test, either hypodermically or subcutaneously. A small dose of 0·1 c.c. is sufficient for the first injection. Subsequent injections are given at intervals of one to seven days, and are increased in strength according to the reaction of the patient. The aim of desensitization is to neutralize the antibodies in the tissues. It is necessary to inject just sufficient antigen, otherwise new antibodies are produced, the patient then becomes re-sensitized.

Method 2.—This method consists in the giving by mouth of gradually increasing quantities of the protein to which the patient is sensitized. This method is not often successful.

Method 3.—Non-specific therapy or *protein shock therapy* are names given to another method of desensitization. It has been found characteristic of all allergic diseases, that any pyrexial condition, or any operation, causes a temporary cessation of symptoms. Asthma, for instance, ceases during an attack of influenza. Antibodies which are fixed in the tissues may be set free in the circulation by *protein shock*, and so the condition is changed from one of *sensitization* to one of *immunity*.

When certain proteins are injected into an organism, an effect is produced known as ‘ protein shock.’ The result is more marked when the injections are given intravenously. Most proteins are capable of producing this effect, but certain bacterial proteins, such as tuberculin and the typhoid bacillus, are most potent in this respect. As methods of non-specific desensitization the following have been used: injection of tuberculin, intravenous injection of peptone, blood withdrawn from a vein and injected intradermally; milk injected subcutaneously.

Treatment of the acute attack.—In the treatment of acute conditions adrenalin given hypodermically gives relief and is especially useful in asthma, urticaria, angioneurotic oedema, and serum collapse.

Adrenalin chloride (strength 1–1000) is given hypodermically in doses of 2 to 15 minims (0·12 to 1 c.c.). The earlier it is given in the attack the less is required, and the better the result. Relief of asthma is usually prompt. In status asthmaticus the method of Hurst is useful. In this method the needle is inserted under the skin and 1 minim of adrenalin is injected every minute until the attack ceases or the pulse rises abnormally. The needle is not withdrawn until the attack is over. Mixtures of adrenalin and pituitrin are also used.

In spite of the diverse forms in which allergy occurs, the following characteristics have been found common to the state:

(1) Changes in the blood and urine occur in association with the attacks.

(2) Skin tests to proteins may often be positive.

(3) There is a tendency to exudation of fluid and increased permeability of capillaries, and spasm of plain muscle.

(4) There are alternating periods or exacerbation and quiescence.

(5) The frequency of the attacks is increased by psychological upset.

(6) Changes of environment and altitude lead to temporary improvement.

(7) In most cases adrenalin abolishes the attack.

(8) There is a tendency for one form of allergy to alternate with another.

(9) There is often a hereditary basis.

The following conditions are now considered to be due to hypersensitiveness to proteins: the treatment of each will be found under their various headings. Variations in this list will probably occur after further investigations into the allergic state have been completed.

Skin.—Eczema; angioneurotic oedema (p. 417); prurigo (p. 420).

Nervous system.—Migraine (p. 388).

Joints.—Rheumatoid arthritis (p. 311); intermittent hydrarthrosis.

Respiratory.—Asthma (p. 249); hay fever (p. 308); spasmodic rhinorrhoea (p. 308).

Intermittent Hydrarthrosis.—Hydrarthrosis is an accumulation of fluid in a joint. The condition known as intermittent hydrarthrosis is intermediate between the arthritis of serum disease (p. 309) and rheumatoid arthritis (p. 311).

Spasmodic Rhinorrhoea.—A form of allergy which shows itself by symptoms which closely resemble hay fever, but which may appear at any time of the year, also called paroxysmal rhinitis, or perennial hay fever.

Symptoms.—Sneezing is the predominant symptom with irritation of the mucous membrane of the nose. It may precede attacks of asthma.

Causes.—The condition may depend on specific sensitization (p. 305) to house dust, animal emanations, face-powder, etc., but in many cases the cause is obscure. The patient often describes the condition as hay fever, and, before desensitization is attempted, protein skin tests (p. 127) are carried out.

Treatment.—If the cause of the condition is found to be due to a particular protein, either avoidance or desensitization may be attempted. In the majority of cases an offending antigen (p. 305) is not discoverable. Calcium lactate and parathyroid extract given by mouth have been successful in relieving the condition. The essential preliminaries of treatment are an exact diagnosis, and a full investigation both of the history and of the bacteriology and physiology of the patient.

Hay Fever (Vasomotor Rhinitis).—Hay fever is an allergic disease and was the first allergic disease recognized as being due to a specific antigen (p. 305).

Causes.—Hay fever is due to the contact of pollen with the sensitized mucous membrane of the nose and throat. In this country there is only one hay fever season of May–July, the exact onset of symptoms depending on the season. In America there are two seasons—the spring season due to grass pollens, and the autumn season due to ragweed. Hay fever belongs to the group of allergies which show a strong hereditary tendency.

Symptoms.—A 'cold in the head,' which only occurs at a certain season, and in association with the pollination of plants such as grasses. There is paroxysmal sneezing, running from the eyes, and a watery discharge from the nose, accompanied by severe itching of the mucous membrane of the nose and back of the throat.

Treatment.—Desensitization to the particular pollen causing the condition, for method see p. 306. A new method of desensitization, 'the rush method,' consists of injecting pollen (or the antigen) every few hours, to increase the tolerance of the patient more quickly. *Reaction.*—Signs of overdose should be watched for, and consist of urticaria (p. 417), headache, gastro-intestinal symptoms, and possibly asthma (p. 249). When such symptoms are present the next dose is reduced. Temporary relief may be gained as described under acute allergic attack (p. 307).

Artificially produced Allergy.—Serum Sickness.—Hypersensitiveness to foreign proteins may be artificially produced in man and has often occurred during treatment of patients by means of antitoxins contained in horse serum (see p. 834).

If a patient who has had a previous injection of horse serum is given a second injection after an interval of from ten days to many years, various symptoms may occur which are termed 'serum sickness.' When horse serum is injected into the patient for the first time, symptoms may occur after an interval of several days without further injection.

Symptoms.—There may be immediate *collapse* with symptoms resembling surgical shock (p. 561), so rapid in its onset that it may occur whilst the serum is still being inserted into the vein. A more common symptom of artificially produced allergy is urticaria (p. 417). Yet another symptom is swelling of the joints. Of less common occurrence is the *respiratory* type, the predominant symptom being laboured breathing similar to that which occurs in asthma (p. 249).

RHEUMATISM

Rheumatism. — (*a*) **Acute Rheumatism, or Rheumatic Fever,** is an acute non-contagious fever, but is thought to be due to a definite organism, a haemolytic streptococcus. Predisposing causes are exposure to cold and wet, heredity.

Symptoms.—The onset is usually acute with high temperature and sore throat; when less acute the onset may be a 'cold in the head,' with a general malaise and feeling of chilliness. One or more joints then become affected. The affected joint is painful, swollen, and tender, and pain is aggravated on movement. The overlying skin may be slightly reddened. The inflammation may leave a joint suddenly and appear in another. There is profuse acid perspiration which has an unpleasant odour, sweat eruptions, i.e. sudamina (p. 413), and miliary are common. The urine is acid and scanty; the bowels are constipated; the tongue moist and thickly coated. The temperature usually rises quickly at the onset, pursues an irregularly febrile course (101°–104° F.), and falls by lysis (p. 194). Anaemia develops rapidly. Delirium if present indicates meningitis (p. 374).

Complications which may arise are endocarditis (p. 271), pericarditis (p. 274), pleurisy (p. 262), pneumonia (p. 251), hyperpyrexia (p. 195) with cerebral symptoms, sore throat, purpuric erythema (p. 286), and chorea (p. 389).

Treatment.—Absolute rest in bed in the recumbent position, between blankets or with a blanket next to the patient, is essential. The clothing should be of wool or flannel. The painful joints should be protected from the weight of the bedclothes by a cradle if necessary. The diet should be liquid until the temperature becomes sub-febrile (p. 195); light diet of a milky nature is then allowed. Meat, soups, and wine must be avoided. The drugs prescribed are salicylate of soda, aspirin (acetylsalicylic acid); opium or morphia may be necessary for the pain. Aperients are ordered when necessary; calomel may be prescribed at the commencement. Alcohol is sometimes required in severe cases, when either brandy or whisky is given. Soda (p. 91) or opium fomentations are applied to the affected joints, which should be wrapped in cotton wool if not being fomented. Hyperpyrexia is treated by tepid sponging (p. 111) or cold packs (p. 110). The patient should be sponged over daily with hot water to which some methylated spirit has been added and afterwards powdered with dusting powder. Great care must be taken to protect the patient from contracting any chill which may cause a relapse. Convalescence is slow, and prolonged rest is needed to enable the heart to recover its tone.

(*b*) **Muscular Rheumatism, or Myalgia,** is a painful condition of the voluntary muscles and the fibrous tissues with which they are connected.

Cause.—Exposure in persons of a rheumatic or gouty tendency may produce an attack.

Symptoms.—The onset may be sudden or gradual, with little or no constitutional disturbance. Pain occurs especially on moving the affected muscles. Stiff neck (rheumatic torticollis), lumbago, affecting the muscles of the small of the back, and pleurodynia (intercostal myalgia) are all varieties of the disease.

Treatment.—The treatment is by rest, light diet, and by drugs such as salicylate of soda, aspirin, and an alkaline aperient. Sanocrysin, a gold preparation, has recently been used with marked success in some, but not all, cases. Local treatment consists in fomentations (p. 90), anodyne plasters or liniments (p. 95), blistering (p. 95), galvanism (p. 741), massage (p. 746), and hyperthermia (p. 113). In cases of pleurodynia the chest may be strapped on the affected side.

(*c*) **Chronic Rheumatism** is a disease of middle age, which may follow an acute attack.

Symptoms.—The symptoms are pain, swelling, stiffness, affecting one or more joints. The pain is a severe aching in character which is often relieved by rubbing. The general health is not affected.

Treatment.—Residence in a dry warm climate during the winter is very beneficial. Local applications of methyl salicylate, blistering (p. 95), iodine, faradism (p. 740), massage (p. 746) are advocated, or treatment at a spa.[1] The diet should exclude beef, beer, and wine, and be of a light and digestible nature. Potassium iodide, iron, arsenic, and guiacol may be prescribed.

Arthritis Deformans is a disease of the joints, giving rise to changes in the synovial membrane, the surrounding tissues, the cartilages, and the bones. It is now considered to be one of the diseases of the allergic group (p. 304).

Rheumatoid Arthritis is the peri-articular type, occurring most commonly in women between the ages of twenty and forty. It is acute, the peri-articular tissues being mainly affected, the joints having a fusiform shape.

Osteo-arthritis is the osteo-arthritic type and is chronic, and occurs mainly between the ages of forty and sixty. The cartilage and bones are mainly affected, the joints becoming nodular in shape.

Causes.—Septic infection is a causal factor in some cases of rheumatoid arthritis. A history of injury is generally obtained in cases of osteo-arthritis. Rheumatoid arthritis may be considered to be allergic but is of a special character, sensitization (p. 305) occurring chiefly in the peri-articular structures.

Symptoms.—In **rheumatoid arthritis** the joints affected swell slowly and are distended with synovial effusion. Atrophy of the muscles and aching of the joints follow. A number of smaller joints of the hands and feet suffer at first, the larger joints being affected later. The skin is often pigmented: profuse perspiration and shooting pains occur in the early stages. In the more acute types, the temperature is raised, and in some cases may be 103°–104° F.: the pulse is rapid. The patient becomes anaemic and in many cases emaciated.

The disease in **osteo-arthritis** is generally localized to one or two large joints. Marked constitutional changes are not present. The changes are limited to the heads of the bone above and below the joints, and muscular atrophy is not a marked symptom. Pain, swelling, impaired mobility, and grating are the principal signs.

Treatment.—It is of the utmost importance to remove sources of infection, pyorrhoea alveolaris (p. 216), leucorrhoea (p. 684), constipation, etc. If the source of the sensitizing agent (p. 304) is removed in the early stages no further treatment is necessary. When the source is removed, but invading organisms are still present, a vaccine of such organisms is required. Treatment of the general condition includes insulin and glucose to restore the glucose tolerance to normal as there is alteration in the dextrose tolerance. The intestinal tract is treated with kaolin and liquid paraffin as abnormal organisms in the intestine have been proved to be a factor in maintaining the condition. When these measures fail owing to the source of infection being undiscoverable, or other causes, desensitization (p. 304) to the urinary ' proteose ' (see glossary) may be helpful. Rest, fresh air with protection from damp and cold, and good feeding are essential. Full diet is given unless the temperature is very high, when meat and wine are excluded; a generous diet rich in Vitamin C is needed. The drugs prescribed include aperients, tonics, and salicylates if the pain is severe, opiates may be ordered in the acute stage, Sanocrysin is now given with good results. Fomentations and the application of methyl salicylate are useful for the relief of pain. After the acute stage is past massage and passive movements are prescribed; hyperthermia (p. 113) may be ordered; the patient should be encouraged to move the affected limbs as much as possible, even though painful. These patients are not confined to bed beyond the acute stage, and should go out daily in a bath-chair or car. Treatment at a spa may be beneficial. Deformed, painful joints may be treated surgically by arthrodesis (p. 473).

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[1] The principal ones are Droitwich, Woodhall, Bath, Harrogate, Buxton, and Sidmouth (not sea water).

GOUT

Gout.—Gout is a disease characterized by inflammation of the smaller joints due to deposits of urate of soda, acute attacks of arthritis, and is frequently associated with disorders of the important viscera.

Causes.—The disease is often inherited. Over-indulgence in alcoholic drinks, nitrogenous foods, and deficiency or excess in exercise may bring about an attack.

Symptoms.—An attack is sometimes preceded by dyspepsia and irritability. The onset of pain in the joint is acute, the big toe the joint most commonly affected. The pain develops suddenly, and generally in the early morning becomes intense, but subsides a little after several hours. The joint swells and is extremely tender, the skin is reddened and oedematous, the veins distended. Feverishness and irritability are marked, the tongue is coated, the urine scanty and high coloured. Thirst, loss of appetite, and constipation are symptoms occurring during an attack. During the day the fever and pain may subside and recur at night.

In Chronic Gout the attacks are frequent and prolonged, and fresh

joints are affected. Sternol wax application may relieve pain (see p. 756). After several attacks in a joint deformity occurs.

Suppressed Gout is an indefinite condition in which gastro-intestinal symptoms such as diarrhoea and vomiting, or cardiac symptoms such as pain, palpitation, faintness, and dyspnoea, or cerebral symptoms such as delirium, develop in those liable to true gout.

Treatment.—Rest in bed during acute attacks is essential. The inflamed part should be elevated and wrapped in cotton wool or fomented (p. 90), and must be protected from the weight of the bedclothes. A mercurial purge may be prescribed followed by colchicum; opiates may be required if the pain is very severe. Colchicum may cause faintness or excessive purging (p. 773).

Diet.—The diet should be liquid whilst the fever lasts; later it should be specially restricted (see purin-free diet, p. 793).

Fresh air, regular exercise, and regular habits, with temperate eating and drinking, should be observed in the intervals of the attacks. The various symptoms of suppressed gout are treated as they arise in addition to the treatment already given. In chronic cases a course of treatment at a spa is often beneficial.

OBESITY

Obesity.—Obesity occurs from a variety of causes and may be classed as follows:

(1) Obesity due to disorders of the endocrine glands, such as thyroid, pituitary, and suprarenal bodies (p. 287).

(2) Obesity due to disease of that portion of the brain which is concerned with the control of body weight.

(3) Obesity due to a variety of causes including heredity and an over-indulgence in carbohydrates which may amount to carbohydrate addiction, persistent immoderation in food and alcohol.

This group is the most common cause of obesity. In these patients there is failure in the weight-regulating mechanism and carbohydrates are too readily converted into fats.

Treatment.—Obesity described in Groups (1) and (2) is treated by correction of the cause if possible. Group (3) is treated by gradual reduction of weight by dieting and exercise. It is best to aim at a gradual reduction of weight of five or six pounds a month by strictly reducing the supply of carbohydrates and fats and by living on a permanently lower caloric intake (p. 795). Easily assimilable carbohydrates are replaced by bulky foods of low caloric but high satiety value, the patient thus lives temporarily on his own fat.

Thyroid extract reduces weight but should not be taken without the advice and supervision of a doctor as it may provoke alarming symptoms, including tachycardia. Exercise is a potent means of reducing weight, but persons past middle age should be cautious in exercise as the elasticity of the heart and blood vessels present in youth has diminished. The patient is weighed every week and the diet varied according to the loss of weight. (See reducing diets, p. 795.) Obesity predisposes to various diseases such as gall stones, diabetes, etc.

CANCER

Cancer, or Malignant Disease.—Cancer is a disease characterized by new growths of a malignant type. Cachexia is usually a marked feature in the disease, the patient appears anaemic, the skin having a yellowish-green or dirty tinge. The body is usually very emaciated, but may be fat.

Cause.—The actual cause is not known. An hereditary tendency is common and a blow or injury may be the immediate precursor of the disease. The growth may be situated in any part of the body. Various forms are designated according to their histologic structure:

(1) **Sarcomata** are malignant growths composed of connective tissue, having an abundance of cells and little intercellular substance. Sarcomata always arise from mesoblastic tissue, as bone, cartilage, or connective tissue; they occur in any organ, but frequently in the bones, periosteum, brain, kidneys, and lungs. Children and young adults are most frequently affected. Various forms of sarcomata are: lymphosarcoma, alveolar sarcoma, tubular sarcoma, angiosarcoma, melanotic sarcoma, chloroma, myxosarcoma, osteosarcoma, sarcomatous cylindroma, psammoma.

(2) **Carcinoma.**—Carcinomata are malignant epithelial tumours. They always arise from epithelial structures, as the skin, mucous membranes, and organs containing tubular glands, etc. They occur most frequently in persons past middle age, although younger or older persons may be affected. Carcinomata occur in all parts of the body where epithelial tissue exists, the most common sites being the skin, stomach, mammary gland, intestines, oesophagus, tongue, rectum, ovaries, uterus, and prostate.

Varieties.—(*a*) Flat-celled carcinoma develops from squamous or stratified epithelium. (*b*) Melanotic carcinoma, of a dark colour—hence the name—contains pigment. (*c*) Columnar-celled carcinoma arises from tissues containing cylindric epithelium. (*d*) Colloid carcinoma is a columnar carcinoma which has undergone colloid degeneration. It occurs chiefly in the digestive tract. (*e*) Adeno-carcinoma develops from glandular tissue. It is divided into simple, medullary, and scirrhous. The scirrhous variety is found in the breasts, ovaries, and testicle. Giant-celled carcinoma is a rare form in which the cells attain a large size. A diffuse cancer of the skin over the breast is termed *cancer en cuirasse*.

(3) An **Epithelioma** is a malignant growth arising from the mucous membranes; occurs commonly in the mouth, tongue, lips, rectum, and bladder.

Treatment.—Surgical treatment is the most reliable known up to the present. Many cures take place if surgical treatment is given in the early stage. Growths which are too large to remove entirely are treated with radium (p. 729), which may reduce the size of the growth to such an extent as to render operative treatment feasible, or may cure the condition without surgical measures. X-ray treatment (p. 726) is given in inoperable conditions, in recurrent cases after operation, and is also used as a preventive against recurrence. (For the nursing of surgical cases see p. 428.) In inoperable cases the growth progresses until the cancer breaks down, and an open fungating mass may result. The nursing consists in rendering the patient as comfortable, happy, and free from pain as possible. He is nursed in whichever position is found to produce the most comfort. Water pillows (p. 22), air cushions (p. 22), etc., are very necessary. The mattress and pillows must all be protected with a mackintosh covering. The wound requires constant dressing (p. 438) with an antiseptic deodorant (p. 765) in order to keep it free from discharge, which is often most offensive. The diet should consist of anything the patient fancies or is able to take. Stimulants are often required. The drugs used are chiefly those given for the relief of pain, which is often very severe—aspirin, bromide, morphia, heroin, etc. Operative treatment may be undertaken for relief of obstruction in the intestinal tract, either colotomy (p. 508), gastrostomy (p. 506), or anastomosis (p. 507).

Great patience, care, and gentleness must be exercised by the nurse, remembering that however revolting the disease appears to the nurse, it is infinitely more so to the patient. She must never give the patient cause to think that she wearies of the perpetual dressings or finds them distasteful.

Haemorrhage frequently occurs, especially in uterine cases (p. 684), and many prove fatal. (For treatment of haemorrhage see p. 565.) Patients with malignant disease may live for a considerable time, death taking place from obstruction (p. 230), toxaemia (p. 577), exhaustion, or haemorrhage.

CHAPTER VIII

THE NURSING OF SPECIFIC INFECTIVE DISEASES

SPECIFIC infective diseases are those caused by infection of the body with a specific germ. Specific infective diseases occurring commonly in connection with wounds will be found in Chapter XVII.

Infection.—(See p. 833.) Pathogenic bacteria (p. 824) gain entrance to the body through the lungs, the alimentary system, or the broken surface of skin or mucous membrane.

Sources of infection.—Air.—By inhalation. Pure air is free from germs, but air contaminated with dust, carbon, and other solid bodies may be a source of infection.

Dust.—The bacteria of acute diseases may attach themselves to dust particles and be inhaled from the air.

Water may become contaminated with sewage, and in this way is frequently the cause of diseases such as typhoid (p. 341), cholera (p. 344), etc.

Milk is an excellent culture medium in which germs grow rapidly and multiply quickly, therefore unsterilized milk which has been exposed to infection is a frequent cause of disease.

Food.—Uncooked food, such as lettuce, cress, oysters, etc., may be contaminated and so carry infection; cooked food may also be a source of infection if unprotected from flies; over-ripe or decomposing food is another frequent cause of infection, i.e. ptomaine poisoning.

Clothing, carpets, books, etc., which have been exposed to infection may harbour the germs of acute infectious diseases for considerable periods, and are a great source of infection unless submitted to a rigorous disinfection after exposure to infection (see disinfection, p. 48). These articles are termed fomites.

Flies are a frequent cause of disease owing to their habits of feeding on garbage and then settling on food and so contaminating it. A number of infectious diseases may be caused through flies; two commonly caused in this way are typhoid (p. 341) and infantile summer diarrhoea (p. 597). Mosquitoes and the tsetse fly carry infection in malaria (p. 326) and sleeping sickness (p. 328). Fleas, body lice (p. 426), bugs, and ticks may all carry infection. Fleas and lice have been proved to be one of the chief sources of infection in typhus (p. 338).

Domestic animals, especially cats, also rats and mice, may carry infection.

Soil.—The most important diseases due to infection from soil are tetanus (p. 582), anthrax (p. 585), gas gangrene (p. 574), and suppuration due to the staphylococcus aureus.

'*Carriers*' are a frequent cause of infection. The term carriers is used to indicate persons who, after recovery from a disease, continue to harbour germs for a long period, or individuals who, after contact with an affected person, carry the germs in their nose, throat, or intestines, and in this way transmit the disease to others although they are healthy themselves.

Susceptibility is the term used to denote the power exhibited by the infected body in resisting and preventing the growth of the germ, or the absence of resisting power which enables the germ to grow and multiply.

Immunity is the term used to denote a condition antagonistic to the development of the germ and which thereby prevents infection taking place. Immunity may be natural or acquired. Natural immunity is the resistance exhibited by a race, or species, to certain diseases; for instance, all animals except man and monkeys are immune to syphilis (p. 322). Acquired immunity may be active or passive. Active immunity is an immunity in which the cells of the body take an active part in its production, and results from previous bacterial activity in the body which may be induced by any of the following ways: an attack of the disease; vaccination or inoculation with a mild form of the disease, as in vaccination for small-pox (p. 334); injections of bacterial vaccines, i.e. vaccine treatment. (For full description see p. 835.)

Prophylaxis, or prevention of the spread of the disease, depends on the recognition of the sources of infection, and on the uses of hygienic and scientific methods for the disinfection of the media by which infection is spread (see 'mode of infection' mentioned under each disease). Prophylaxis forms an important part in the nursing of all acute specific diseases. Incubation period, p. 331; period of quarantine, p. 331.

For convenience, specific infective diseases have here been divided under two headings, viz. contagious diseases and acute infectious diseases.

CONTAGIOUS DISEASES

Under this heading are included specific infective diseases which may be transmitted through contact with infected discharges and excretions; by inoculation, either from bites of vermin or insects, or by the germ gaining access to the subcutaneous tissues through an injury to the skin or mucous membrane.

Isolation.—Infection is not transmitted in these cases except by direct contact with the patient or the infectious discharges of secretions, therefore if the following precautions are observed there should be no risk of spreading or contracting the disease. The patient may be nursed in a general medical ward, or if in private, a separate room should be used, but the strict isolation required in infectious air-borne diseases is not required.

All discharges must be disinfected or burnt immediately. Sputum, soiled dressings, etc., should be burnt. Faeces, vomit, and urine need to be disinfected (p. 47) in the utensils containing them before being emptied in cases in which infection may be spread in this way. Bed and body linen must be disinfected before being laundered (p. 47); feeding utensils, toilet crockery, dressing bowls, etc., kept separate and disinfected after use (p. 47). If able to be up and about, the patient should not use a lavatory used by others. The nurse should wear an overall when attending to the patient, and when dressing wounds, etc., rubber gloves should be worn. The nurse's hands must be protected from abrasions or cuts, any abrasion being carefully covered with an antiseptic dressing (p. 438). The hands and arms must be disinfected (p. 46) each time after touching the patient and immediately before partaking of food. Sun and fresh air are most essential, as they are potent germ destroyers. The general nursing required will be found on p. 212. (For the preparation and care of the room see p. 9.)

Tuberculosis.—Tuberculosis is a disease due to infection by the tubercle bacillus. The infection may be a local or a general one. The disease may attack part of the body; in childhood bones, joints, glands, the brain, the peritoneum, and general tuberculosis are the most common forms. In early adult life, phthisis is the most usual form. (For medical and surgical treatment of phthisis see p. 257.)

Mode of infection.—By ingestion, eating or drinking infected food; by contact with the sputum of a phthisical patient, whether the sputum is moist, or whether it has dried and is inhaled as dust; by using feeding utensils in use for tuberculous patients; by contact with the discharge from tuberculous wounds and sores. A patient suffering from a local lesion may infect himself in another organ either through his blood, or in phthisis by swallowing the sputum. Predisposing causes are deficiency of fresh air and sunlight; deficiency of food; insufficient clothing; colds; debility; over-work; hereditary predisposition.

Treatment.—The general treatment is the same in all forms of the disease, and, in addition, local treatment is given according to the part affected. Open-air treatment is commonly prescribed, and consists in the patient living in the open air day and night. For this purpose a shelter is used if procurable. It consists of a wooden hut with windows, one side of which is completely open, and is made to revolve so that the open side is away from the wind and rain. Many other types of shelters are made, but this will be found to be one of the most convenient. When a shelter is not obtainable or advisable, a veranda may be used, or the patient should be nursed in a large sunny room with the windows open night and day, or the window may be removed. Rest in bed is ordered until the temperature is no longer febrile, then gentle exercise, and later graduated work interspersed with frequent rest hours.

The *diet* is most important; the patient must be made to take the amount of food prescribed by the physician whether he feels inclined for it or not. Meat, fat, eggs, bacon, milk, and bread, etc., are prescribed in as large a quantity as can be taken without producing sickness. The patient is weighed every week (for tables of weight and height see p. 854). Patients who are steadily losing weight in spite of being fed up are kept at rest. The *drugs* prescribed consist of tonics, cod-liver oil, malt, etc. Tuberculin is given subcutaneously (p. 86) in many cases. The clothing must be warm and light. In cold weather plenty of hot bottles, blankets, and an eiderdown should be provided. Many of these patients remain out of doors even in cold weather, fresh air and sun having more effect in the destruction of the bacillus than any other agent. In order to prevent the spread of infection, it is important that patients suffering from tuberculosis of the lung or air passages should be provided with a pocket sputum flask (Fig. 172) when able to be up and about.

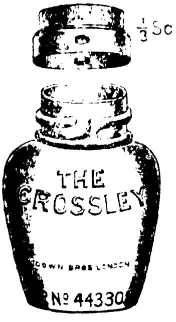

FIG. 172. Pocket sputum flask.

Acute General Tuberculosis.—Miliary Tuberculosis.—This form of tuberculosis may be acute or chronic. Tubercle bacilli gain entrance to the blood stream from an existing tuberculous lesion in the lungs, bones, glands, intestine, or other parts, and give rise to a number of secondary lesions. After coming to rest in some organ the bacilli multiply.

Symptoms.—The symptoms vary with the different organs attacked. The general symptoms are pyrexia, which is usually high, 104° F. or more (see chart, Fig. 173), it is remittent or

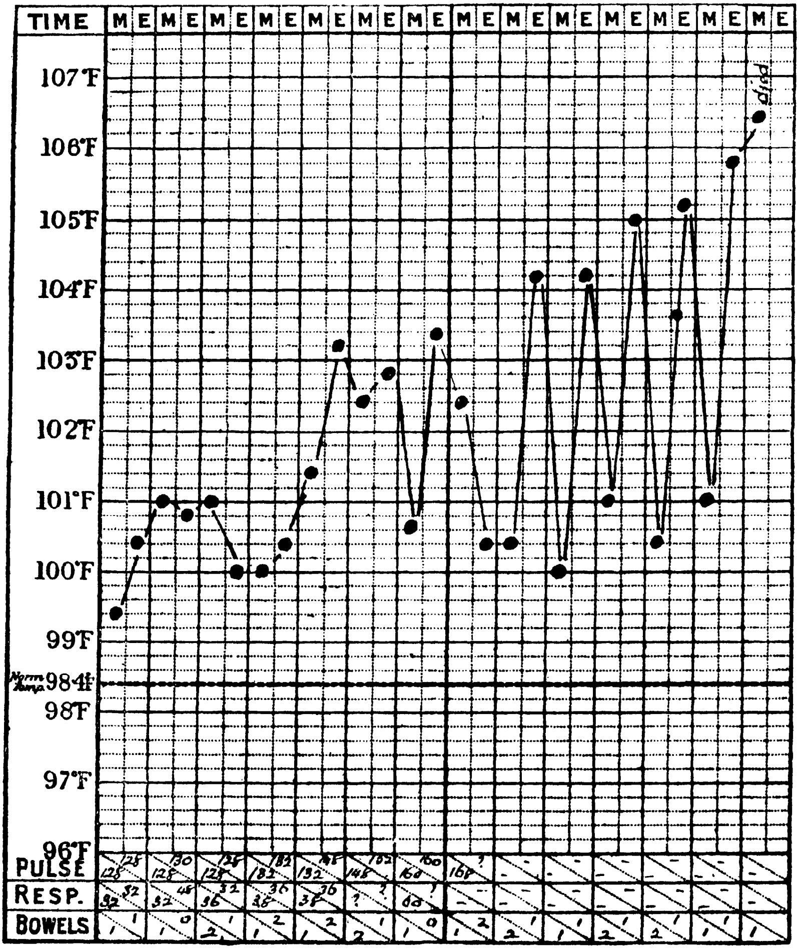

Fig. 173. Temperature chart of miliary tuberculosis occurring in an infant 7 months old.

intermittent, and often of the inverse type (for descriptions of types see p. 199). The pulse is weak and quick, and the respiration rapid. In an acute case, in the course of a few weeks the typhoid state (p. 210) supervenes, and the patient dies comatose (p. 360), or with pulmonary or meningeal symptoms.

Treatment.—The treatment is directed to the relief of the various symptoms as they arise. *Drugs* are prescribed for vomiting, diarrhoea, delirium, cough, and pain. The regulation of the bowels is important. Food is administered as constantly and in as large a quantity as possible. Hyperpyrexia (p. 195) is treated by cold or tepid sponging (p. 111). Recovery from the acute form is rare. The special treatment required for local tuberculosis affecting the various organs will be found under their respective headings, and is given in addition to the general treatment just described.

Tuberculosis of bones, joints, the kidneys, trachea, etc., is treated surgically in addition to the general treatment.

Leprosy.—Leprosy is a chronic disease due to a specific bacillus (the bacillus leprae), and marked by the development of granular swellings (granulomata) in the skin and mucous membranes (tubercular or nodular leprosy), or in the nerves (anaesthetic leprosy).

Mode of infection.—By consumption of contaminated food; by contact with the discharges of leprous sores, or the secretions of the nose and mouth when those organs are affected; or from other secretions such as the urine, milk, etc. The bacillus may also be found in the blood.

Period of incubation (p. 331).—A few weeks to many years.

Description of the rash.—Successive eruptions of erythematous spots varying in number and size occur; they may be pigmented or not. At first they are hyperaesthetic (p. 363) and transient; later they become anaesthetic (p. 363) and permanent (macular leprosy). At the same time, or later, granulomata appear either in the skin (nodular leprosy), or in the nerves (anaesthetic leprosy), or in both (mixed leprosy).

Symptoms.—The patient may suffer for months or years from feverish attacks, weakness, and pains before the spots or granulomata appear. In nodular leprosy the granulomata appear in crops at varying intervals, each eruption being attended by feverish symptoms for a day or two. The nodules occur chiefly on the exposed parts, i.e. the hands, face, etc.; they may also cause ulceration of the cornea, and the mucous membrane of the nose, mouth, larynx, etc. In the anaesthetic variety the superficial nerves can be felt to be thickened. The first symptoms are those of nerve irritation, i.e. neuralgia, tingling, etc., and later of nerve destruction, i.e. anaesthesia (p. 363), muscular atrophy (p. 192), bullae ulceration (p. 573), and gangrene (p. 573). The nerve type is more chronic than the nodular leprosy.

Treatment.—The patient should be removed to a part where the disease is not endemic (p. 330). Surgical treatment is given for some cases of acute and persistent pain, and also in cases with necrosed bone, etc. *Drugs.*—Chaulmugra oil is given in capsules in increasing doses, the oil, either pure or made up as a liniment, is rubbed into the skin; Gurjun oil is used in the same way. Other drugs include arsenic, sodium salicylate, aspirin, Calmette's anti-venomous serum, Rost's leprolin, and Decycke's benzoyl-nastin, ichthyol, and chrysarobin.

Recovery may take place in either form, but occurs most commonly in nerve leprosy, although much deformity may result.

The chief complications are phthisis (p. 257) and amyloid disease (p. 581).

Syphilis.—Syphilis is a disease due to infection with an organism, the spirochaeta pallida. It is usually a venereal disease, but not always so. It may be congenital (p. 605).

Mode of infection.—In acquired venereal syphilis, sexual intercourse; in acquired non-venereal syphilis, contact, either with or without an abrasion of the skin, with a syphilitic sore; contact with discharges from syphilitic patients; nursing syphilitic infants, the nipple of the wet-nurse may become infected; kissing.

Incubation period.—Variable, about 3 to 5 weeks. The disease is divided into three distinct periods, i.e. primary, secondary, and tertiary stages. The primary and secondary stages are contagious, but not so the tertiary.

Primary stage.—The characteristic symptom is the appearance of a sore (primary sore or *chancre*) which develops at the site of inoculation. The chancre starts as a small papule (p. 189) situated in the true skin which grows and becomes hard or indurated at its base, whilst the surface forms a raw, greyish-red sore with a slight watery discharge which may form a scab (p. 189), or, if irritated, may ulcerate; but its characteristic sign is the induration at its base. The nearest lymphatic glands become enlarged but are painless (syphilitic bubo); if the primary sore is situated on the genitals, the glands in the groin are affected; if on the finger (extra-genital chancre), the gland above the inner side of the elbow is affected. After a few months the primary sore heals, leaving a scar. Typical indurated sores on the female genitals are rare; these sores more often resemble ulcers (p. 573) and are called 'soft chancres.'

Secondary stage.—This stage occurs from six to eight weeks after the development of the primary sore. The symptoms include slight elevation of temperature with malaise, and, in rare cases, high fever of the remittent or intermittent type (p. 195). Cutaneous eruptions appear at this stage; they are called *syphilides* and are of various kinds. The earliest and most common (the syphilitic roseola) appears as a dark-red mottling of the skin on the body and limbs; the face is not often affected. The spots are most frequently seen on the abdomen; they fade on pressure at first, but not later. In the later stages the rash becomes a coppery colour. Other varieties are the squamous syphilide, resembling psoriasis (p. 415); the papular syphilide, resembling lichen (p. 416); the pustular syphilide, resembling small-pox (p. 334). Syphilitic rashes are always symmetrical, tend to become a coppery colour, and may be mixed (polymorphous), several varieties occurring at the same time.

At this stage in most cases the throat is affected, and may present whitish, superficial, symmetrical ulcers resembling snail tracks. Inflamed and slightly swollen areas, greyish-white in colour, called mucous patches (*condylomata*), appear on the mucous membranes of the mouth, nose, anus, and vulva. Hypertrophy of the papillae of the mouth, genitals, and anus causes syphilitic warts. The glands in the neck may be enlarged, those felt below the hair at the back, and along each side of the neck. Other symptoms which may be present in different cases are alopecia (p. 363), anaemia (p. 283), headache, iritis (p. 635), synovitis, deafness, and periostitis (inflammation of the periosteum).

Tertiary stage.—The tertiary stage appears about the third or fourth year, but may be earlier or later. In cases treated from the first it may be absent or very mild. Any part of the body may be affected. The typical symptom of this period is the 'gumma.' A *gumma* is a grey translucent or gummy-looking mass with a fibrous exterior which tends to undergo necrosis (p. 573) or becomes caseous in the middle. Gummata are not symmetrical, and are often single or few in number. They may appear in the bones, causing necrosis; in the brain, causing paralysis (p. 361); in the heart, lungs, abdominal organs, or any part of the body, causing symptoms of disease in the organs affected, the treatment of which has been dealt with under the respective organs. (For congenital syphilis see Chapter XVIII, p. 605.) General paralysis of the insane (p. 406).

Treatment.—Drugs form a most important part of the treatment. Mercury, iodobismuthate, arsenic are prescribed for the primary and secondary lesions, and iodide of potassium for tertiary affections. Intravenous injection (p. 76) of novarsenobillon (Salvarsan, '606') is given in many cases; this method brings about a much more speedy cure. Patients treated with mercury by mouth may in addition be ordered mercurial inunction (p. 97) or mercurial injections (p. 85). Those having a course of mercurial treatment should have a simple diet, use a mouth wash frequently, and keep the teeth particularly clean. Fever therapy has recently been tried with some success in the treatment of syphilis affecting the nervous system, i.e. locomotor ataxy (p. 371) and paralysis of the insane (p. 406). The patient is infected with a benign form of malaria, which is allowed to run a short course, then terminated by treatment with quinine. (See also hyperthermia, p. 113.) Patients should be warned of the contagiousness of the primary and secondary stages, and should not marry until they have been free of all symptoms for two years or longer, or pathological examination (Wassermann test) proves negative.

Gonorrhoea.—This term is applied to a contagious venereal disease caused by infection with gonococcus. It causes acute purulent inflammation of the vagina in the female and of the urethra in the male.

Mode of infection.—Sexual intercourse in the venereal type; in the non-venereal type, by contact with discharges from patients suffering with the disease. The disease may remain local and subside after suitable treatment, viz. constant cleansing with suitable antiseptic solutions, and vaccine treatment; or may become general (gonorrhoeal rheumatism); or may extend to the conjunctiva, causing gonorrhoeal ophthalmia (p. 632); to the uterus, causing endometritis (p. 683); to the Fallopian tubes, causing salpingitis (p. 683); to the ovaries, causing ovaritis.

General Gonorrhoeal Infection (Gonorrhoeal Rheumatism).—*Symptoms.*—Changes in the joints and fibrous tissues resembling rheumatism (p. 309) occur. There may also be conjunctivitis (p. 631), endocarditis (p. 271), pericarditis (p. 274), pleurisy (p. 262), myelitis (p. 369), peritonitis (p. 235), and iritis (p. 635). There is usually slight pyrexia.

Treatment.—Vaccine treatment is given. The following drugs may be prescribed: quinine, potassium iodide, arsenic, and morphia may be necessary for pain. For the arthritis, application of heat to the joint, counter-irritation, or Bier's treatment (p. 104) may be ordered. In some cases surgical treatment may be required. After the acute stage has subsided, massage (p. 750) and passive movements are given to the joints.

For gonorrhoeal ophthalmia and ophthalmia neonatorum see Chapter XX, p. 632.

Glanders.—Glanders is a contagious disease of the horse due to the bacillus mallei.

Mode of infection.—By contact with the discharges from a horse suffering with the disease, usually contracted through an abrasion in the skin; it may be contracted from a patient suffering from the disease in the same manner. The local or primary lesion is called glanders, when it becomes generalized it is known as *farcy* and takes the form of pyaemia (p. 577).

Incubation period.—Three days to two weeks.

Symptoms.—The acute form commences with shivering and pains all over the body accompanied with pyrexia. After a variable number of days, during which the symptoms increase in severity, nodules develop in the skin and muscles, and inflammatory patches develop in the skin. The nodules become soft, then ulcerate. The mucous membrane of the respiratory tract may be involved, and arthritis (p. 311) may be present. The typhoid state (p. 210) supervenes, and death takes place in from one to six weeks. In the chronic form, the onset is gradual with slight constitutional disturbances, or with a rash. After several weeks, cutaneous and muscular lesions develop which give rise to chronic ulcers (p. 573) and sinuses. The disease may continue over months or years and may at any time become acute.

Treatment.—Attention to the general health and maintaining the strength as far as possible are the chief lines of treatment. Surgical treatment is given. If the discharge from patient or horse suffering with the disease comes in contact with an abrasion or wound it should be immediately cauterized.

Yaws.—This is a contagious specific infection of tropical countries.

Mode of infection.—A breach of surface is necessary for inoculation. The virus from a yaws sore may reach the abrasion either directly or through the medium of fomites, insects, etc.

Incubation period.—Variable; from two weeks to two months.

Symptoms.—The symptoms include pains in the limbs and digestive troubles, and slight fever may be present for a week or two before the rash appears. Sometimes one papule may be found at the seat of inoculation. The disease may continue over weeks, months, or years.

Description of the rash.—When the eruption becomes general it starts as small itchy spots about the size of a pin-head. The spots may then disappear, but more often grow and burst through the skin; yellowish matter then forms on top and dries into a scab (p. 189). The spots vary in size and may be as large as a golf ball or larger. The eruption may comprise a few or many spots.

Treatment.—The treatment consists in good food, hygienic surroundings, and the avoidance of chills. The drugs given include mercury, potassium iodide, arsenic, or iron. Iodoform and sulphate of copper may be applied locally.

Verruga.—A disease of tropical climates.

Mode of infection.—By drinking contaminated water.

Incubation period.—Fourteen to forty days.

Symptoms.—The symptoms vary, the commonest being severe articular and muscular pains with intermittent or remittent fever, anaemia, and weakness.

Description of the rash.—The eruption may appear after three weeks or later. It chiefly affects the skin of the face and limbs, but may be general and involve mucous and serous surfaces. The spots consist of itchy red papules (p. 189) or warts, which may be as large as an orange. They gradually disappear, but may ulcerate or bleed very freely. Dysphagia (p. 670) and dyspnoea (p. 205) may be caused if the mucous membranes are affected. The disease is frequently fatal.

Treatment.—Immediate removal to a warm sea-coast town is a necessity. Haemorrhages are treated as they occur, also the resulting anaemia. In other respects the treatment is that given under yaws.

Contagious Diseases transmitted by Insects.—Malaria.—This term is applied to a group of specific infections characterized by continuous, intermittent, or remittent pyrexia, splenic enlargement, and anaemia.

Mode of infection.—Contracted through insect bites, chiefly mosquitoes. May be prevented by the use of D.D.T., which kills insects, see p. 840.

Incubation period.—From six days to several weeks.

Symptoms.—The chief symptom is intermittent fever or ague. The attacks of fever may occur daily (quotidian), every third day (tertian), or every fourth day (quartan) (see chart, Fig. 174). The paroxysm consists of three stages, i.e. the cold, the hot, and the sweating stage. The cold stage commences with lassitude, yawning, headache, and sometimes sickness. A violent rigor (p. 207) then sets in, the skin feels cold, the temperature rises quickly and may reach 105° F. or higher. This stage lasts for a few minutes to a couple of hours, and is followed by the hot stage in which the skin appears and feels hot. The patient suffers from heat, thirst, headache, and sometimes delirium. This stage may last from four to five hours and is followed by the sweating stage, which is marked by free perspiration and relief from all symptoms. It may extend over a few hours or less. During the paroxysm the spleen is enlarged. During the interval the patient feels well.

Irregular, Remittent, Continued, and Aestivo-autumnal Fevers.—*Symptoms.*—There may be malaise for some days or there may be a sudden onset with a rigor. The fever continues for some time,

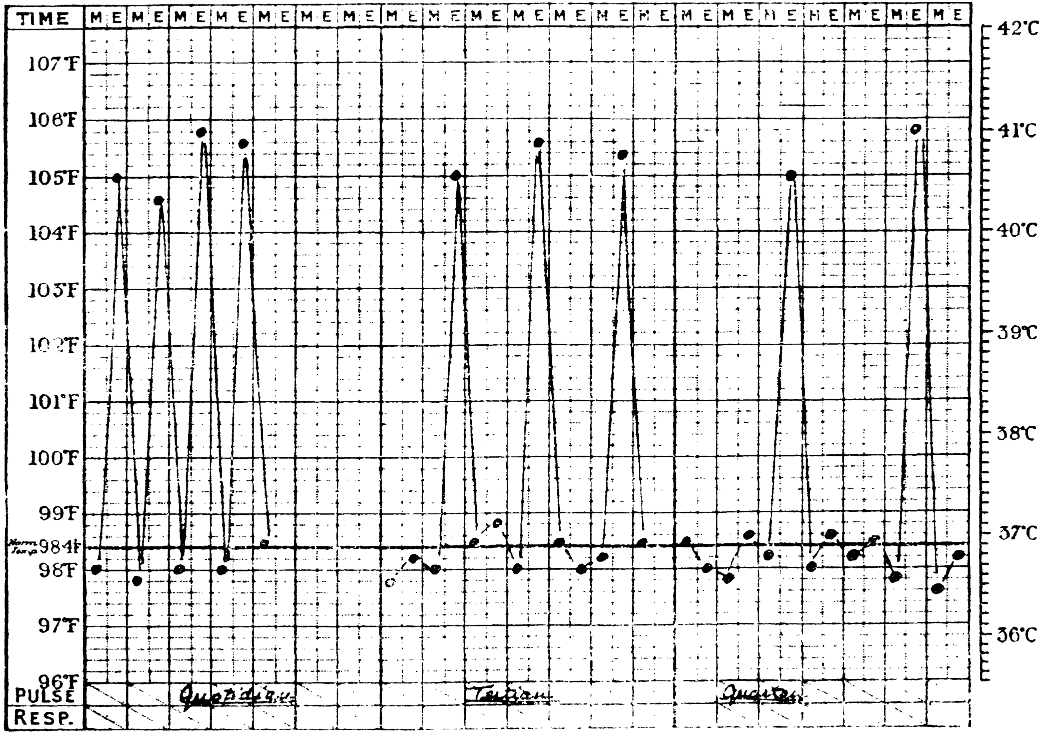

FIG. 174. Temperature chart of malarial fever showing three types of the disease.

often for one or two weeks. The temperature remits, but there is no intermission. With the remission there may be slight sweating. The general appearance of the patient may resemble that of a patient suffering from enteric (p. 341).

Pernicious Malarial Fever is marked by symptoms pointing to serious involvement of some organ. In the comatose form there is high fever, coma (p. 360), or delirium (p. 359), and the patient may die in the first or during a later attack. In the collapsed form there is diarrhoea, vomiting, and intense prostration.

Black Water Fever occurs only in those who have suffered from malaria. The symptoms include high fever, bilious vomiting, and dark-coloured urine which may be almost black. Jaundice (p. 232) usually occurs. Death takes place commonly in the first attack, but the patient may survive several attacks.

Malarial Cachexia is marked by splenic enlargement and anaemia.

Treatment.—Preventive treatment is of the utmost importance. Mosquito bites should be avoided by the use of efficient mosquito curtains at night. During the paroxysm, in the cold stage, rest in bed is necessary, with the application of hot blankets, hot bottles, and hot drinks (see rigor, p. 207). Later the extra blankets are removed and tepid drinks are given. During the sweating stage the patient should be rubbed down with warm towels and have the garments changed. At this stage he should be allowed to sleep if inclined, and be fed up as much as possible. The chief drugs prescribed are quinine and arsenic, which may be given by mouth, intramuscularly (p. 85), or intravenously (p. 76). Saline is given by the rectum (p. 57) every four or six hours. Stimulants are often necessary, and opium is sometimes ordered. During the interval between the attacks the patient should take as much nourishment as possible in order to maintain his strength and enable him to withstand the subsequent paroxysms.

Trypanosomiasis (Sleeping Sickness).—This term is applied to a disease of Equatorial Africa due to infection by trypanosomes, which are parasites that live in the blood of vertebrates but are transmitted from one vertebrate host to another by an intermediary host, which is a blood-sucking invertebrate.

Incubation period.—Thought to be from ten to twenty days.

Symptoms.—The primary symptoms include recurring attacks of fever, which may be either mild or severe; enlargement of the lymph glands, and of the spleen; debility of mind and body; anaemia; oedema (p. 190); and erythema (p. 188). This condition may extend over months or years, and in some cases dies out altogether, but it usually merges into the secondary phase known as *sleeping sickness. The symptoms of the second stage are* slowness of speech; lack of facial expression; headache; tremor (p. 361) of the hands and tongue; disinclination for work. The pulse is quicker than normal. Later there is increasing lethargy with convulsions (p. 588), paralysis (p. 361), and bedsores (p. 363). Death may be due to hyperpyrexia (p. 195), convulsions, pulmonary complications, or some intercurrent acute disease. The condition may be acute or chronic and last several months or years.

Treatment.—No specific remedy has been discovered. Compounds of arsenic or antimony may be injected. The patient should leave the endemic area (p. 330) and endeavour to maintain his general health in the best condition possible.

Yellow Fever.—The term applied to an acute specific fever occurring in the West Indies and America.

Mode of infection.—Transmitted by mosquito bite.

Incubation period.—From a day to a fortnight.

Symptoms.—The onset is sudden, with shivering or a rigor (p. 207), accompanied with severe pain in the eyes, forehead, loins, and legs. The temperature rises to 103° or 104° F., and remains at this level for a day or two. The eyes are injected (p. 629), the face has a bloated appearance, thirst, anorexia, and epigastric tenderness are present. These symptoms comprise the primary stage, during which the patient may die. Between the primary and secondary stages there is an intermediary period in which the patient feels much better, the temperature falls, the pulse is abnormally slow, and albumin is present in the urine (p. 236). Jaundice (p. 232) may appear about the third day. Convalescence may follow this stage or the secondary symptoms may become manifest. The second stage begins about the fourth day and is marked by remittent fever (p. 196), or a subnormal temperature; intense prostration; deepening jaundice; vomiting; severe albuminuria (p. 236); scanty urine; and sometimes delirium. The vomit is at first bilious; later it becomes dark, coffee-ground vomit (p. 184). Diarrhoea (p. 186) may be present. There is sometimes erythema (p. 188) of the vulva or scrotum. Haemorrhages may occur from the mouth, nose, stomach, intestine, uterus, and subcutaneously.

The complications include hepatitis (p. 233), parotitis (p. 216), and abscesses (p. 518). A relapse may occur, and is very dangerous. Death commonly takes place about the ninth day, but some cases recover.

Treatment.—At the commencement of the illness the bowels are opened with castor oil, after which only enemata (p. 62) are used for this purpose. Frequent hot mustard foot-baths (p. 117) are given during the first 24 hours. Fomentations (p. 90) are applied to relieve the pains. If the urine becomes scanty, fomentations and dry cupping (p. 104) are applied to the loins, and hot packs (p. 109) or hot-air baths (p. 112), and rectal injections of saline (p. 57) are given. Phenacetin is ordered for the relief of pain, but opiates are not prescribed. Strychnine and other stimulants may be ordered if there is great weakness. During the primary fever no food is given, water is administered in small quantities by mouth and saline by the rectum. During the intermediary and secondary periods very light liquid diet is given in small quantities. An error in diet may cause a relapse which may prove fatal.

Quarantine.—Fifteen days.

Dengue.—This term is applied to an acute specific fever of warm climates.

Mode of infection.—Transmitted by a mosquito.

Incubation period.—One to five days.

Symptoms.—The onset is sudden with high fever, pains in the head, joints, and muscles. The face is bloated, the eyes are injected (p. 629), the pulse rapid, and the skin covered with an erythematous rash. After about three days the primary fever comes to an end by crisis (p. 193) or lysis (p. 194). The patient feels better, although he still has joint pains. After an interval of two or four days without fever, another paroxysm occurs which is slighter and shorter than the previous one and is accompanied by a more marked rash which may be measly (p. 333), urticarial (p. 417), or scarlatiniform (p. 332). It spreads from the upper limbs to the face and trunk, then to the lower limbs, after which it gradually fades in the same order.

Treatment.—The treatment is that given under general treatment (p. 316). The disease is very rarely fatal. In districts where mosquitoes are numerous the disease may be epidemic (see below). Preventive treatment consists in the destruction of the mosquitoes and protection from bites.

ACUTE INFECTIOUS DISEASES

Under this heading are included specific infective diseases which are transmitted by air, by fomites (p. 316), by direct contact, by discharges or excretions, by a third person, and by 'carriers' (p. 317). A disease is said to be *endemic* when it is constantly prevalent in a certain locality; it is termed *epidemic* when a large number of persons are affected in a locality during a short period. *Exanthemata* are acute infective fevers accompanied by a rash or eruption, i.e. small-pox, scarlet fever, measles, enteric, typhus, chicken-pox, etc.

Acute infectious fevers pass through four stages, i.e. incubation period, period of invasion or onset, period of defervescence (p. 199), and convalescence.

(1) The *incubation period* is the time which elapses between the entrance of the germ into the body and the development of the first symptom of the disease. (2) The *period of invasion* is the time which elapses from the appearance of the first symptoms until the climax is reached. (3) The *period of defervescence* occurs from the time the climax is reached until those symptoms have gradually disappeared. (4) *Convalescence* is the period in which the disease has died out but the patient is recovering from the effects of the disease or its complications.

Quarantine is the period in which the disease may become manifest in a person who has been exposed to infection, a period in which a person so exposed should remain isolated in order to prevent the spread of the disease. The duration of quarantine is usually fixed at two days longer than the recognized incubation period of the disease in question, and can only be considered safe if thorough disinfection (p. 47) has been carried out at the commencement of the quarantine period. It is important also to note that the quarantine period can begin only from the date of the latest exposure. (For table of periods of incubation, quarantine, etc. see p. 858.)

Isolation.—The patient is isolated, either nursed in a ward set apart for the particular disease, or in a separate room (p. 9). Disinfection of the linen, crockery, excreta, discharges, and everything that comes into the infected area must be conscientiously carried out. (Disinfection, see Chapter II.) An Aerosol—penicillin spray—is effectual (see p. 841).

Visitors should not be allowed without the physician's permission. Any person entering the infected room or ward should previously be clothed in an overall, cap, and overshoes. Whilst in the room they should not be allowed to come into contact with the bed or the patient. On leaving the room the overall, cap, and overshoes should be removed, and the hands and face washed with hot water and soap. Visitors are less likely to become infected if they are in a good state of health, partake of a meal immediately before the visit, and take a walk subsequently. Before being allowed to contact others, the patient is thoroughly disinfected (p. 47). The nurse must attend to the disinfection of everything that has been used, also the room, etc., and finally disinfect herself and her clothing. A period of quarantine must be observed subsequently.

Nursing.—The patient is kept in bed in all cases until the temperature is normal and usually for a week or so afterwards. Colds and chills must be avoided, as relapses may be due to these causes, and many of the complications are caused by chills.

The temperature, pulse, and respiration are taken every four hours until defervescence sets in, except in mild cases, when twice a day will suffice. The diet is liquid and should be given in quantities of five ounces every two hours until the temperature is normal, after which light diet is allowed. During convalescence the patient is given a liberal full diet. The urine should be tested twice a week for albumin (p. 35). Special care must be taken to guard against complications likely to occur; should they supervene, the treatment is that already given in Chapter VI. Other nursing points will be found under the nursing of medical cases (see Chapter VI, p. 212).

INFECTIOUS FEVERS, EXANTHEMATA, AND EPIDEMIC DISEASES

Scarlet Fever.—An acute infectious fever accompanied by a rash; due to a specific organism, the streptococcus haemolyticus scarlatinae.

Tests.—*Dick* test is a means by which the susceptibility of a person to scarlet fever may be determined (p. 128).

Schultz-Charlton reaction, or blanching test, is used in the diagnosis of doubtful cases (p. 128).

Mode of infection.—By air, by contact with articles that have been in the infected area (fomites), by contact with the discharges from a person suffering with the disease. The disease is frequently epidemic (p. 330), especially in the autumn.

Incubation period.—Two to six days.

Symptoms.—The invasion is sudden, with shivering, headache, vomiting, pains in the limbs and back, and sore throat. The temperature rises high the first day, the pulse is rapid, the face flushed, and the tongue furred. The tongue is red at the tip and edges and covered in the centre with a white fur through which the swollen papillae project (strawberry tongue). The throat is red and inflamed. The local condition in the throat, the rash, the pyrexia, and other general symptoms increase in severity for about two days (second to fourth day of illness), then a gradual improvement sets in, the temperature falling by lysis (p. 194).

Description of the rash.—The eruption appears on the second day, first on the neck and chest, later all over the body. It consists of a bright-red diffuse flush, in the midst of which are scattered small red spots. The rash increases in intensity for about two days, then gradually fades and is gone by the end of the first week. As the rash fades, desquamation (p. 189) sets in, it may be slight (branny), or extensive peeling may occur.

Malignant scarlet fever is of the toxic variety. The symptoms are those already given but are very intense. Delirium may be present. The rash may become petechial (p. 189). Death usually takes place within a week or earlier.

Treatment.—The specific treatment is by administration of anti-scarlatina serum, 10–20 c.c. being injected intramuscularly, or into a vein. Particular care in the avoidance of a chill which may cause albuminuria (p. 236) is important. Hot baths are allowed after the first ten days. A mild antiseptic oil may be ordered for rubbing over the body whilst desquamation is taking place. The patient is allowed up when the temperature has been normal for a week. If no complications occur, this is about the end of the first fortnight. (For further treatment see general treatment, p. 330.)

The complications which may occur include: Albuminuria (p. 236); nephritis (p. 241); dropsy (p. 239); otitis media (p. 656); arthritis (p. 311); cervical adenitis; conjunctivitis (p. 631); endocarditis (p. 269); bronchitis (p. 248); empyema (p. 264); chorea (p. 389); and jaundice (p. 232).

Period of isolation.—Six weeks or until desquamation has ceased.

Period of quarantine.—Ten days.

Measles (Morbilli).—An acute infectious fever accompanied by a typical rash.

Mode of infection.—By air, fomites, and discharges. It may also be conveyed by a third person who has been in contact with the disease. It occurs frequently in epidemics during January and June.

Incubation period.—From four to fourteen days, usually ten days.

Symptoms.—The onset is acute, with shivering, headache, running of the eyes and nose, a hoarse cough, sickness, and sometimes diarrhoea. The temperature rises gradually and falls by crisis (p. 193) when the rash has become general.

Description of the rash.—The rash appears on the fourth day, first behind the ears and on the face; then extends downwards over the limbs and becomes general. It consists of small, red, elevated spots which increase in size, run together, and form patches which are separated by healthy skin. The rash fades on the seventh day and may be followed by fine desquamation. A brownish stain may remain for a day or two after the rash has faded. The eruption is in a few cases delayed beyond the fourth day, the temperature remaining high or becoming higher until it appears. Before the rash appears, small red spots with a bluish-white centre may often be detected on the mucous membrane of the cheeks and lips (Koplik's spots). On the seventh day of the disease, or the third of the eruption, all the symptoms, in normal cases, begin to subside.

Treatment.—Particular care is needed in the avoidance of cold and the prevention of chest complications. Serum treatment is now available and may be given as a prophylactic measure, or to protect delicate children after exposure to infection. Conjunctivitis (p. 631) is common, and for this reason the eyes require to be protected from any bright light. Reading and writing should not be allowed until all inflammation has subsided. A liberal diet is necessary as soon as the temperature becomes normal. The patient is allowed up when the temperature has been normal for a week if no complications occur, usually about the end of ten days or a fortnight.

The complications include: Broncho-pneumonia (p. 254); laryngitis (p. 669); bronchitis (p. 248); otitis media (p. 656); diarrhoea (p. 186); phlyctenular conjunctivitis (p. 631); gangrenous stomatitis (p. 215); tuberculosis (p. 318); whooping-cough (p. 354); albuminuria (p. 236).

Period of isolation.—Three weeks after the appearance of the rash, or longer if all catarrhal symptoms have not subsided.

Period of quarantine.—At least sixteen days.

German Measles (Rötheln).—An infectious fever of a mild type.

Mode of infection.—By contact, air, and fomites.

Incubation period.—Seven to twenty-one days.

Symptoms.—The symptoms are swelling, tenderness, and enlargement of the lymphatic glands, slight fever (99° to 100° F.), and malaise. The glandular tenderness may be the first symptom or the rash may appear first.

Description of rash.—The rash appears in the course of a few hours. It consists of slightly elevated round or oval spots which may run together. It fades about the second or third day and may be followed by slight desquamation.

The disease often resembles a slight case of scarlet fever or measles. The treatment is that given under general treatment (p. 330). The patient is allowed up as soon as the rash has faded and the temperature is normal.

Period of isolation.—Ten days after the appearance of the rash.

Period of quarantine.—Twenty-two days.

Fourth Disease.—An infectious disease resembling either scarlet fever, measles, or german measles, but distinct from all three.

Incubation period.—Nine to twenty-one days.

Symptoms.—The body becomes covered in a few hours with a diffuse red rash, the face may not be affected. The rash is followed by desquamation.

Isolation and quarantine periods as for german measles.

Small-pox (Variola).—An infectious fever marked by an eruption which goes through three stages, viz. papule, vesicle, and pustule.

Mode of infection.—By direct contact, air, and fomites.

Incubation period.—From five to twenty-one days, usually twelve days.

Symptoms.—The invasion is sudden, with rigors (p. 207), fever, headache, nausea or vomiting, and pain in the lumbar region. In children convulsions may take the place of rigors. The temperature may reach 104° or 106° F. The pulse is rapid.

Description of rash.—The characteristic eruption is sometimes preceded by an erythematous or petechial rash (prodromal rash). The erythematous variety may involve the whole surface, or be localized, and in appearance may be either measly or scarlatiniform. The petechial or haemorrhagic variety appears most commonly on the abdomen and the upper parts of the thighs. In some cases the prodromal rash is both erythematous and haemorrhagic. These rashes fade in the course of a few days, the characteristic eruption appears from the third to the fourth day first on the arms and face, then on the wrist and trunk, and finally on the lower limbs, palms of the hands, and soles of the feet. The eruption does not confine itself to the skin but appears on the mucous membranes. The spots commence as small papules (p. 189) which enlarge, and about the sixth day develop into vesicles (p. 189) which have a flattened pearly appearance. About the ninth day the vesicles suppurate and become pustules (p. 189). These grow for a time, and about the twelfth day begin to dry up, and scabs (p. 189) form. After a time the scabs drop off, leaving red elevated spots which eventually subside, leaving either no mark or depressed scars.

With the appearance of the eruption the temperature falls and a great improvement takes place in the general condition. When the vesicles become pustular the temperature rises again and the patient feels ill (secondary fever) (see chart, Fig. 175). In mild cases the disease may practically end when the eruption appears and not continue through all its stages; this is more often the case in patients who have been vaccinated. The eruption on the mucous membranes may cause dysphagia (p. 670) and salivation may be troublesome. When it occurs on the urethral mucous membrane there may be difficulty in micturition. Conjunctivitis (p. 631) results when the conjunctiva is attacked. A peculiar, greasy, disagreeable odour, typical of the disease, is present in nearly every case. In a simple case of small-pox the pocks remain separate from each other (discrete small-pox). In more severe cases they may be in close contact with each other (confluent small-pox). The latter is always a serious condition and the symptoms are usually much more severe. In this type the temperature becomes lower when the rash appears, but does not

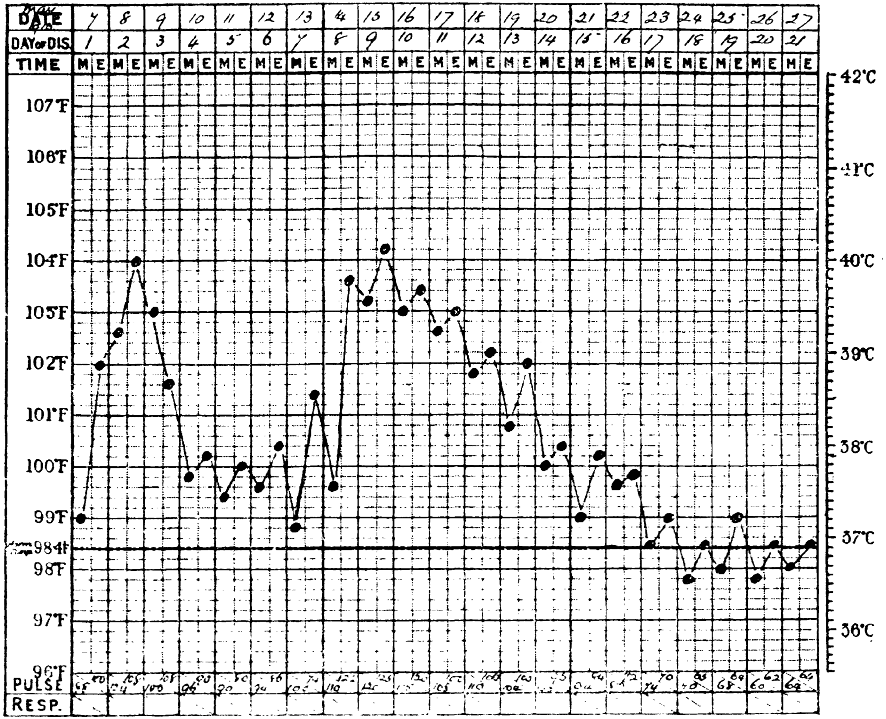

Fig. 175. Temperature chart of a case of small-pox.

become normal, remaining about 101° to 102° F. and rising when the pustules appear. Malignant small-pox is a fatal type, and may be of two kinds. In one type the usual eruption is preceded by an erythematous rash with haemorrhages into the skin and mucous membranes; haemorrhages may also occur from the nose, mouth, stomach, uterus, bladder, and rectum. Death usually takes place during the first week. In the other type the case commences as an ordinary case of small-pox, and later haemorrhages take place beneath the pocks. In either type the skin appears red at first and later becomes plum-coloured.

Treatment.—Pain is alleviated by opium. Cold moist applications are applied to the skin of the body to allay irritation, which may be intense. Carbolic (1–20) or perchloride of mercury (1–5000) is useful for this purpose. The eyes and mouth require very frequent cleansing, every two hours or oftener. When the scabs form, the skin of the body is lubricated with oil to prevent dry particles becoming detached and mixing in the atmosphere. The skin of the face should be kept moist with some non-oily fluid. At this stage a daily hot bath is given which helps the scabs to separate.

Hyperpyrexia (p. 195) is treated by cold sponging (p. 111) or cold packs (p. 110). Stimulants are usually required. When the temperature becomes normal a liberal but easily digested diet is given. In uncomplicated cases the patient is allowed up as soon as the fever subsides. Unvaccinated persons living in the same building should be vaccinated immediately.

The complications include: Laryngitis (p. 669); bronchitis (p. 248); broncho-pneumonia (p. 254); pleurisy (p. 262); empyema (p. 264); myocarditis (p. 273); conjunctivitis (p. 631), leading to keratitis (p. 634); otitis media (p. 656); paralysis (p. 361); boils (p. 413); abscesses (p. 518); septicaemia (p. 575); erysipelas (p. 581); orchitis (p. 354); parotitis (p. 254); scarring of the skin (pitting).

Period of isolation.—Until all scabs have disappeared.

Period of quarantine.—Sixteen days.

Vaccinia.—A disease of cows which may be communicated to man by vaccination, or handling infected cows.

Symptoms.—The symptoms are those which occur after vaccination, i.e. a local eruption which goes through the stages of papule, vesicle, and pustule.

Vaccination.—After vaccination it is important to keep the skin covered with sterile gauze dressing and wear a protective pad. Fomentations are applied if there is much inflammation, and the limb kept at rest. An attack of vaccinia affords protection (immunity, p. 835) against small-pox.

Chicken-pox (Varicella).—An infectious disease characterized by an eruption of vesicles on the skin.

Mode of infection.—By contact and by fomites.

Incubation period.—Twelve to twenty-one days, usually a fortnight.

Symptoms.—There may be slight malaise, but the rash is often the first symptom.

Description of rash.—The rash appears within the first twenty-four hours as small red papules on the face and trunk. In the course of a few hours the papules develop into vesicles containing a clear fluid which becomes turbid after a couple of days; the vesicles then dry and scabs form. Several successive crops of vesicles appear during the first few days. The temperature is very slightly raised in most cases and is of the intermittent type (p. 195), being raised before each crop appears and becoming normal after its appearance.

Treatment.—The spots should be dusted over with an antiseptic dusting powder to allay the irritation. The child should be prevented from scratching the vesicles on the face, as scars may result. A daily bath is given and the child is allowed up when the temperature is normal.

Period of isolation.—Until all the scabs have fallen off, usually two or three weeks.

Period of quarantine.—Twenty days.

Typhus.—An acute infectious fever which occurs in epidemics in unhygienic surroundings.

Mode of infection.—By contact, by fomites, and by infected lice fleas, bugs, etc. Prevented by using D.D.T. powder, which kills the infected insects, see p. 841.

Incubation period.—Twelve days usually, but may be from two to twelve days.

Symptoms.—The onset is sudden, with rigors (p. 207), headache, pains in the back and limbs, thirst, anorexia, constipation, furred tongue, flushed face, bloodshot eyes, contracted pupils, and sometimes vomiting. The temperature rises quickly (103° F. or more during the first day), and continues to rise for a few days longer. The pulse is rapid. In the latter part of the first week the pulse becomes more rapid and feeble, the temperature continues high (103°–105° F.) with slight daily remissions. There may be delirium at night. The tongue is dry and brown. The patient's body has a peculiar characteristic odour.

Description of rash.—The rash appears from the fourth to the eighth day, usually the fifth day, and has two features, i.e. spots and mottling. The spots are elevated, small, pink, and ill-defined. They appear first about the axillae but quickly spread over the limbs and trunk. When fresh they fade on pressure. Later they become haemorrhagic (petechial) and do *not* fade on pressure. They persist until the crisis (p. 193). The second feature of the rash consists of a dusky mottling.

In the second week the symptoms attain their climax. Headache is replaced by delirium, which may be violent but is usually of the muttering type (p. 580). The typhoid state (p. 210) supervenes in the majority of cases. The crisis occurs on the fourteenth day. In favourable cases the temperature falls by crisis (p. 193), the pulse is less rapid and stronger, the respiration rate slower. The skin becomes soft and moist and some natural sleep is obtained. The head symptoms disappear gradually, the appetite returns, and convalescence sets in, although intense feebleness remains for some time. In unfavourable cases the coma (p. 360) deepens and the patient dies from heart failure.

Treatment.—The diet should be liquid and nourishing and be administered in quantities of five ounces every two hours. It may consist of milk, milk-bovril (p. 815), egg-flip (p. 817), meat juice (p. 819), etc. In addition, plenty of cold water or imperial drink, glucose and lemon (p. 821), may be given. After the crisis, solid food is allowed. *Local applications.*—The skin should be washed over daily with an antiseptic such as Lysol. The mouth must be cleansed at least every two hours (p. 15). An ice-bag may be ordered for the relief of headache. Hyperpyrexia (p. 195) is treated by cold packs (p. 110); delirium may also be treated in this way. Constipation is relieved by castor oil or enemata (p. 62). The drugs prescribed include stimulants such as strychnine, digitalis, ammonia, etc., and lead and opium for diarrhoea; alcohol is prescribed in all but the mild cases; morphia, caffeine, or aspirin may be ordered for the pain in the head.

The patient should be moved in bed from time to time in order to prevent hypostatic pneumonia (p. 257) occurring. Should it supervene, linseed poultices (p. 90) or antiphlogistine (p. 103) may be ordered. The bladder should be emptied regularly by catheter (p. 66) if retention or partial incontinence is present.

The complications include: Bronchitis (p. 248); pneumonia (p. 251); hypostatic congestion of the lungs (p. 257); pleurisy (p. 262); glandular swellings; bedsores (p. 17); uraemia (p. 238); thrombosis (p. 281); paralysis (p. 361); dementia (p. 405).

Period of isolation.—Five weeks from the commencement of the illness.

Period of quarantine.—Fourteen days.

Disinfection.—Particular care is needed in the disinfection of the clothing. The clothes worn at the time of infection should

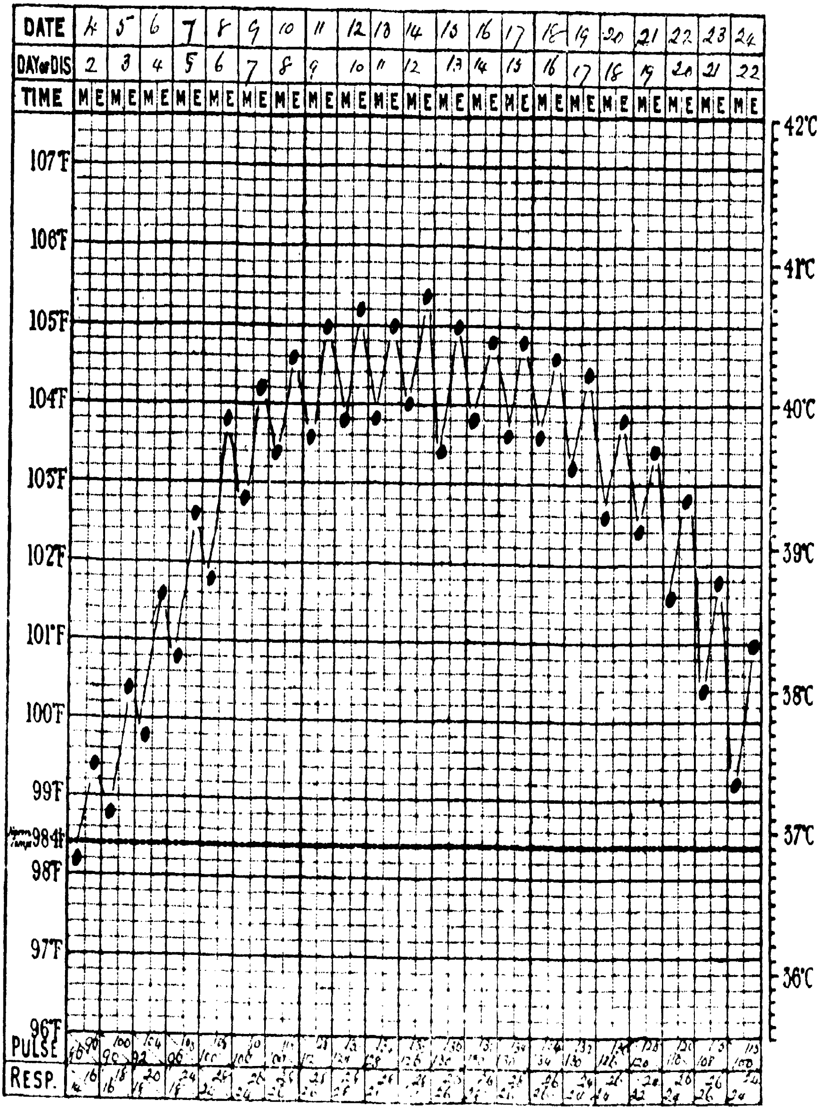

FIG. 176. Temperature chart of a case of typhoid fever.

be burnt. The patient should not be allowed to mix with others until he has had several disinfectant baths (p. 118).

Enteric Fever (Typhoid).—A contagious fever characterized by a special lesion of the intestine, by swelling of the mesenteric glands, and a rash caused by the bacillus typhosus.

Mode of infection.—By swallowing the bacillus. This most commonly occurs through partaking of contaminated food, viz. water, milk, or food polluted with the excreta of a typhoid patient, flies being frequently the means by which infection is conveyed to the food; raw shell fish may become polluted by sewage; swallowing dust containing dried particles of excreta; or inhaling gases from a sewer containing typhoid excreta.

Incubation period.—Two to twenty-three days, usually twelve days.

Symptoms.—The invasion is gradual, with general malaise, headache, lassitude, anorexia, and sometimes epistaxis (p. 668). The temperature rises gradually during the first week, a rise of one or two degrees each evening and a fall of less than the rise the following morning (see chart, Fig. 176). The pulse is full. At this stage there may be some abdominal discomfort and diarrhoea, and headache is constant. Towards the end of the first week the symptoms become more marked, the temperature shows a well-marked morning remission. The pulse is now full and soft and about 110 per minute. The tongue is moist, red at the margins, the remainder covered with yellowish fur. Diarrhoea is usually present, the stools presenting a typical appearance, i.e. pea-soup stools (p. 185), but in some cases constipation is present. The abdomen is slightly distended and may be tender. The cheeks are flushed, the pupils dilated, sweating is common, and headache disappears. The Widal test is positive.

Description of rash.—The characteristic eruption appears on the seventh day, and in some cases is preceded by an erythematous rash. The true rash may appear earlier, later, or not at all. It consists of small oval rose-coloured spots (rose papules); they are slightly elevated and can be felt with the finger. They come out in successive crops, chiefly on the abdomen and shoulders, and may be few in number or numerous.

During the second week the symptoms are intensified. The temperature is still remittent, but the evening rise is higher and the morning remission less; the pulse is rapid (120–136), soft, and becomes more feeble. The patient is emaciated and weak. The tongue is dry and either brown or clean and beefy (p. 207). Diarrhoea may be severe; the stools are offensive. The spleen is enlarged. Delirium is common at night. The patient has a typical odour about him. In severe cases the typhoid state (p. 210) may be present.

About the middle or end of the third week the temperature begins to fall by lysis (p. 197), in such a way that for a time the pyrexia is remittent (p. 200), then becomes intermittent; each morning fall exceeds the evening rise. The symptoms gradually become less severe with the fall of temperature, and the patient begins to long for food. Sloughs (p. 185) may be passed in the stools, and haemorrhage may occur from the ulcerated patches of intestine. In severe cases the intestine may perforate, causing acute abdominal symptoms and peritonitis (see perforation, p. 513).

Treatment.—The patient is kept absolutely at rest lying flat in bed until a week after the temperature has become normal. For washing, bedmaking, etc. (p. 20), he should be gently rolled on the side; except in cases attended with haemorrhage or perforation, when he should be moved as little as possible, one nurse gently lifting him whilst a second nurse attends to the bed, etc.

Diet.—Liquid diet is given usually during the first week. A quantity of five ounces, either warm or cold, consisting of milk, albumin water, beef-tea, cocoa, milk-tea, milk-coffee, jelly, etc., is administered every two hours. Later, semi-solid food is given (see p. 791, bland diet). Attention to the diet is of the utmost importance, and however much the patient craves for food, it must not be given, or increased in amount, without the physician's orders. A relapse which may terminate fatally may be brought about by an error in diet.

The mouth requires careful cleansing before and after food, and oftener in some cases (p. 15). If it is difficult to clean, peroxide of hydrogen should be used for swabbing, followed by glycerine and borax. Hyperpyrexia (p. 195) is treated by cold or tepid sponging (p. 111), cold packs (p. 110), or baths (p. 117). If baths are ordered, a special stretcher or hammock is used, the patient being immersed for ten or twenty minutes every four hours (temperature of the bath, 80° F.). In every case the patient should be sponged all over night and morning whether other measures are required or not. Constipation is relieved by enemata (p. 57), an enema being given every other morning unless an action of the bowels takes place naturally. Aperients are not prescribed until the patient is convalescent. Diarrhoea is treated by starch and opium enemata (p. 60). An ice-bag to the abdomen may be ordered if haemorrhage occurs.

Treatment by drugs includes intestinal antiseptics such as salol, and hexamine as a urinary antiseptic. Sleeping draughts are prescribed if insomnia is obstinate. Alcohol is ordered in the majority of cases, but is not given if haemorrhage occurs (see treatment of internal haemorrhage, p. 511).

In uncomplicated cases, the patient is allowed to be propped up in bed when the temperature has been normal for a week, and is allowed upon a couch when the temperature has been normal for a fortnight.

The complications include: Relapses; intestinal haemorrhage (p. 222); perforation (p. 513); bronchitis (p. 248); pneumonia (p. 251); albuminuria (p. 236); nephritis (p. 241); peripheral neuritis (p. 365); thrombosis (p. 281); hemiplegia (p. 377); neurasthenia (p. 394); insanity (p. 402); otitis media (p. 656); pyelitis (p. 240); cystitis (p. 245); periostitis; boils (p. 413); abscesses (p. 518); septicaemia (p. 575); arthritis (p. 311). The chief dangers are intestinal haemorrhage and perforation.

Period of isolation.—A week after the temperature becomes normal, or until the faeces and urine are proved to be free from the organism.

Period of quarantine.—Twenty-three days.

Disinfection.—The stools and urine must be disinfected (p. 48) before being emptied away until the patient is convalescent and proved not to be passing organisms. Carriers (p. 317) occur in this disease.

Paratyphoid Fever.—A disease due to injection with the paratyphoid bacillus; there are three types, A, B, and C.

Symptoms.—The symptoms are practically identical with those of typhoid, but usually are less severe. Widal's test gives a positive reaction.

Treatment.—The treatment is that already given for typhoid. It must be borne in mind that however mild the attack may appear, the excreta are equally infectious, and that the attack may at any time develop into a more acute form, or relapses may occur, therefore the same precautions must be taken as for typhoid. Vaccination against typhoid and paratyphoid is now possible. It has been proved in the army that vaccinated persons are much less susceptible to the disease, and if it is contracted, it is of a mild type and rarely fatal. It is therefore advisable that all persons likely to come into contact with the disease should be vaccinated.

Relapsing Fever.—An acute infectious fever due to infection with the spirochaeta obermeieri. It occurs in under-fed and destitute persons, and is frequently associated with famines.

Incubation period.—A few hours to several weeks.

Mode of infection.—By contact, fomites, and vermin.

Symptoms.—The onset is sudden, with rigors (p. 207), headache, giddiness, thirst, anorexia, sickness, and pains in the back and limbs. The temperature rises quickly and is high (104°–106° F.). The tongue is coated, the skin jaundiced (p. 188), the liver and spleen are enlarged. Constipation is usually present, but there may be diarrhoea. In rare cases, rose spots appear; they resemble those of enteric (p. 341), but are smaller. The temperature continues as high pyrexia or hyperpyrexia (p. 195) for a period of five to seven days. The crisis (p. 193) occurs from the fifth to the seventh day, the temperature falls rapidly, and may fall 10° F. in twenty-four hours, and become subnormal. Defervescence (p. 199) is accompanied by profuse sweating, diarrhoea, diuresis (p. 191), and sometimes by haemorrhages from the mucous surfaces. The temperature then rises gradually to normal, and after a few days the patient feels well. A week after the crisis a relapse occurs, and is a repetition of the original attack but rather shorter. After this, convalescence sets in, but is very tedious. There may be several relapses, but in almost every case one relapse occurs.

Treatment.—The usual treatment of fevers is given (p. 316). Hyperpyrexia (p. 195) is treated by sponging (p. 111) or cold packs (p. 110). The chief drug ordered is quinine, and morphia may be necessary for the relief of pain. The diet is liquid and given in small quantities until the temperature is sub-febrile. During the crisis stimulants in the form of alcohol, strychnine, etc., may be necessary.

The complications include: Cardiac failure (p. 276); bronchitis (p. 248); pneumonia (p. 251); dysentery (p. 224); haemorrhage (p. 563); parotitis (p. 216). The chief dangers are from heart failure, haemorrhage, and exhaustion.

Period of isolation.—Until convalescent.

Cholera.—An acute infectious disease due to the presence in the intestines and stools of a specific microbe, the comma bacillus.

Incubation period.—A few hours to ten days, usually three to six days.

Mode of infection.—By ingestion of contaminated food, viz. food polluted with excreta of cholera patients; the food or drink may become infected by means of flies, defective sanitation, contact with unwashed hands, by carriers, etc.

Symptoms.—The disease is divided into four stages, i.e. (1) premonitory stage; (2) evacuation stage; (3) collapse stage; (4) reaction stage.

(1) In the premonitory stage, diarrhoea, prostration, and abdominal discomfort are the chief symptoms.

(2) In the evacuation stage, stools of great volume are passed in rapid succession without pain, accompanied by urgent vomiting.

(3) In the stage of collapse, the surface of the body is cold; the eyes are sunken; the urine is scanty or suppressed, and contains albumin (p. 236), the pulse becomes almost imperceptible at the wrist; the temperature in the axilla is subnormal, but the rectal

temperature may show fever. Diarrhoea and vomiting are much less, or may have ceased.

(4) In the stage of reaction, the temperature rises to normal, the pulse becomes perceptible at the wrist, there is no diarrhoea or vomiting. In favourable cases the surface becomes warm, the urine increases in amount, and a gradual return of strength takes place. In other cases, the surface of the body remains cold, the urine is scanty or suppressed (p. 237), the pupils are fixed, the cornea hazy; a semi-comatose condition (p. 360) supervenes and ends fatally.

Blood changes.—The very great loss of fluid from the body produces marked changes in the composition of the blood, the red corpuscles are increased as a consequence of abstraction of fluid from the blood: in very acute cases they number from eight millions per c.mm. About the fourth day there is usually a rapid fall as the fluid has by then been replaced. The white corpuscles show a marked increase. The specific gravity of the blood rises, whilst normally it is about 1054–56 in cholera it may be as high as 1068–72. With the great loss of fluid from the blood it follows that concentration of the salts would go up, but in cholera it has been found that the chlorides of the blood are also drained away with the fluid, leaving the serum with a percentage of chlorides as low as 0·6 per cent. In addition the alkalis of the blood are depleted and a condition of acidosis (p. 292) is thus easily induced. These two salt losses require the use of hypertonic and alkaline saline transfusions.

Treatment.—The fundamental principles of treatment are as follows. The specific gravity of the blood is estimated in order to find out the loss of fluid from the blood and serves as a reliable guide to the necessity for administering saline transfusion and the required amount to be given. This estimation is made regularly every morning and evening, and whenever there are signs of dehydration or collapse. Normal specific gravity is 1056. If the specific gravity of the blood is 1063, three pints of saline are given; if 1064, four; if 1065, five pints; and if higher, up to a maximum of seven pints. The specific gravity of the blood may be safely reduced to 1052–54.

The blood pressure is recorded at the same time as a fall to a dangerously low level, below 80–70 in adults and 40–30 in children, is a very urgent indication for saline or blood serum tranfusion even though the specific gravity of the blood is not much raised.

The rectal temperature is then taken and this will serve as a valuable guide as to the temperature at which the saline should be administered. If the rectal temperature is subnormal transfuse at a temperature of 102° F., but if the rectal temperature is

102°–104° F. cool the saline to 90° F. Hyperpyrexia is no contra-indication to the use of saline transfusion, provided it is given cool or iced.

Another important indication for transfusion is the presence of muscular cramps. Rogers's alkaline solution is first given, followed by hypertonic saline to replace the lost salts and increase them a little above the normal standard. As long as the urine is *acid* plenty of alkaline bicarbonate of soda and salt solution, both intravenously and by mouth, are given in order to check the tendency to acidosis which predisposes to suppression of urine with consequent uraemia (p. 238). The blood pressure is noted at frequent intervals and all available means used to maintain a level of 110–120 in adults, and 60–70 in children, which is necessary to ensure free renal secretion. The urine is measured and carefully noted.

Saline hyperpyrexia after transfusions, with renewed absorption of toxins with returning circulation, is responsible for a number of deaths in cholera. Hyperpyrexia is treated by an iced saline enema, tepid sponging, and ice applied to the head. Choleraphage is given four hourly by mouth and intravenously when a transfusion is given to combat the toxins. The patient is encouraged to take bicarbonate of soda in water, with glucose and water, in small quantities by mouth even though he is vomiting. Particular care is required in the administration of food, which should be given frequently and in small quantities, commencing with a teaspoonful every five minutes and consisting of albumin water with glucose, boiled and diluted milk, meat jelly with glucose, etc. Starchy foods are not allowed until the patient is convalescent.

The complications include: Pneumonia (p. 251); uraemia (p. 238); a rash may occur (roseola cholerica). Later, chronic enteritis (p. 224); anaemia (p. 283); insomnia (p. 358); ulceration of the cornea (p. 634); parotitis (p. 216); gangrene (p. 573).

Isolation period.—Until convalescent, at least seven days from complete cessation of diarrhoea. Carriers (p. 317) occur.

Period of quarantine.—One week.

Disinfection.—All the excreta require careful disinfection (p. 48) before being emptied. Flies and vermin should be got rid of as far as possible. The disease frequently appears in epidemic form. The water used for all purposes and all utensils should be boiled. Milk should be boiled, and as a means of prophylaxis (p. 317) all food must be carefully protected from flies.

Acute Anterior Poliomyelitis (Infantile Paralysis).—An acute infection occurring either in sporadic or epidemic form (p. 330). The sporadic variety attacks children under six years old most commonly. An epidemic may attack adults in considerable numbers, or may be almost confined to children. The disease is more prevalent in cold than warm countries.

Cause.—Infection by a micro-organism discovered by Flexner in 1913.

Mode of infection.—By air, fomites, discharges from nose and throat, by carriers (p. 317).

Incubation period.—Not yet determined. The cultivated germ takes from four to fourteen days, but from person to person four days is the usual period.

Symptoms.—The onset is sudden and marked by moderate fever (101°-103° F.), restlessness, headache, pain in the back, and muscular soreness. Less frequently there may be vomiting or diarrhoea, and occasionally convulsions occur. In some cases there is neither pain nor constitutional disturbance. The paralysis develops quickly; it may involve all four limbs, or may be confined to a portion of one limb or a certain group of muscles; most commonly more than one limb is affected, the legs being especially prone to suffer. Paralysis of the diaphragm may supervene. The maximum paralysis may be reached within a few hours or days, and then begins to improve, in many cases only a small amount remaining at the end of a few weeks or months. Complete recovery may take place, but is rare. The constitutional symptoms soon pass off; sensation remains intact, the sphincters are not affected, and there is no tendency to bedsores. The paralysed muscles waste rapidly, lose their tendon reflexes, and soon yield the reaction of degeneration (p. 740). Permanent deformity often ensues from the retardation of growth in the paralysed limbs and the over-contraction of the unantagonized muscles. The skin of the paralysed limb is blue and cold.

Varieties.—Apart from the form described, there are (1) abortive cases, in which the constitutional disturbance is unattended by paralysis and complete recovery occurs in a few days; (2) meningitic cases, in which the early symptoms resemble those of cerebrospinal meningitis; (3) bulbar cases, in which the nuclear centres in the medulla oblongata are involved; and (4) polyneuritic cases, in which pain in the limbs is the most conspicuous feature.

Treatment.—The patient is kept in bed in the recumbent position, either on the side or back. Fomentations are applied over the affected part of the spine. The affected limbs must be wrapped up in warm cotton wool, and relieved from the pressure of the bedclothes. Morphia may be necessary for the relief of pain. Lumbar puncture (p. 86) may be performed for relief of headache; an intrathecal injection (p. 87) of human serum from a patient convalescent from the disease may also be given. The usual diet of febrile cases is given. Frequent and prolonged baths may be ordered either during the acute stage or later. Warmth is the most essential treatment for the affected limbs during the acute stage. If paralysis of the diaphragm occurs, the patient may need to be placed in a Drinker respirator (p. 549) in order to maintain respiration. Later, fresh air, good food, tonics, massage and electrical treatment, and exercises are given. Great care is necessary in the nursing to prevent deformities of the paralysed limbs occurring, special splints or other devices being used to keep the limbs in good position. The patient is allowed up after all acute symptoms have subsided. The patient and those attending him should have the throat sprayed twice a day with an antiseptic as a precautionary measure. Sporadic cases are seldom fatal; great improvement takes place with prolonged and suitable treatment.

The complications include: Bronchitis (p. 248); pneumonia (p. 251); meningitis (p. 374). Later, talipes (p. 621) and deformities of the affected limbs may occur.

Period of isolation.—Until the nose and throat are free from the germ.

Quarantine.—Fourteen days.

Disinfection.—Discharges from the nose and throat should be burnt immediately. Paper handkerchiefs and serviettes should be used. In other respects the disinfection is that already given (p. 330).

Plague.—An infection due to a specific bacillus (bacillus pestis) which is present in the blood, excreta, and tissues, and associated with bubonic swelling.

Mode of infection.—By contact with the excreta or blood of an infected person. Rats and rat fleas may spread the disease.

Incubation period.—Three to five days.

Symptoms.—The onset is sudden, with headache, giddiness, fever, and prostration. The temperature rises quickly to 104° F. or more. The pulse is rapid. The mental condition is affected early, the patient has a frightened, haggard appearance, and delirium may be present almost from the commencement. The spleen is enlarged, the urine scanty, the bowels constipated, but diarrhoea may be present. The typhoid state (p. 210) may supervene. Within one or two days buboes develop. They occur most commonly in the inguinal glands; the glands enlarge rapidly and may be painful. They frequently suppurate, which is a good sign. Haemorrhages may occur under the skin and are termed plague spots or tokens. The patient may die within twenty-four hours, haemorrhages from the mucous membranes being a common cause of death. If the patient survives, convalescence begins about the end of the first week. The disease may take on the form of pneumonia (p. 251) or broncho-pneumonia (p. 254), especially in Europeans.

Treatment.—Vaccine treatment is given. For the constipation, an aperient, chiefly calomel, is prescribed. Morphia is given for pain. Ice-bags and cold applications to the head are useful for headache and delirium. Hyperpyrexia (p. 195) is treated by cold packs (p. 110) or sponging (p. 111). Stimulants are usually prescribed. Collapse is treated by warmth and stimulants (p. 768). The diet is restricted to liquids until convalescence sets in. Milk, lemonade, and cooling glucose drinks are given freely. If the buboes suppurate, they are treated as abscesses (p. 464).

Period of isolation.—Until all discharges and the excreta are free from the plague bacillus.

Period of Quarantine.—Ten days.

Disinfection.—All discharges and excreta need to be disinfected (p. 48). Rats and vermin must be destroyed.

Diphtheria.—A specific contagious disease due to the Klebs-Löffler bacillus, and associated with exudation on a mucous membrane producing a 'membrane.' To confirm diagnosis a culture swab (p. 118) is taken and if the Klebs-Löffler bacillus is found the report returns 'positive.' Diphtheria often occurs as a complication of other infectious diseases. *Schick's test* is a means by which the susceptibility of a person to the disease may be determined (p. 128).

Mode of infection.—By ingestion, drinking contaminated milk, by direct contact, discharges, and fomites, and by carriers (p. 317).

Incubation period.—One to seven days.

Symptoms.—The onset may be gradual or acute. The early symptoms are headache, slight sore throat, pains in the back or limbs, and swelling or tenderness of the glands of the neck. The temperature is raised and is usually moderately high (101°–102° F.), but is most irregular. The tongue is coated, the urine scanty and often contains albumin (p. 236). The fauces are swollen and red, with patches of membrane which is whitish at first and later becomes yellowish or grey and resembles washleather. It may be loosely or firmly adherent, its chief characteristic being that on removal the underlying tissue bleeds. In severe cases the membrane grows and extends very rapidly. If it extends downwards into the larynx and trachea symptoms of obstructed respiration become apparent, and, unless relieved by tracheotomy (p. 662) or intubation (p. 666), death by suffocation occurs. Death from sudden heart failure may occur when the patient is apparently progressing satisfactorily. Diphtheria may attack any mucous membrane and has been known to occur in the nose, larynx, trachea, palate, mouth, throat, conjunctiva, vagina, and wounds. Mild cases are termed benign, and severe cases, with marked toxaemia (p. 577), malignant.

1. **Faucial Diphtheria** is usually more severe in children, and is

associated with a thick membrane, pain on swallowing, and a tendency to spread to the nares and larynx.

2. **Laryngeal Diphtheria**, or membranous croup, is most common in children. It may either be secondary to diphtheria elsewhere or may be primary. The voice is hoarse at first, then lost. The breathing is difficult and stridulous (p. 205). The cough acquires a peculiar metallic ring (see croupy cough, p. 603). The membrane may be coughed up in considerable quantities.

3. **Nasal Diphtheria** is usually secondary to faucial.

4. **Conjunctival Diphtheria** (p. 631) may be primary, contracted by a patient coughing into the attendant's eye whilst treating the throat, or secondary to a throat affection. Diphtheria of wounds is usually secondary.

Treatment.—The patient is nursed lying flat in bed. He should on no account be allowed to sit up or exert himself in any way, however mild the attack may appear, until all risk of cardiac failure is past; sitting up suddenly may prove fatal in an apparently mild case. Antidiphtheritic serum is administered as soon as possible (p. 85). Local applications consist in swabbing the throat every four hours or oftener with the prescribed antiseptic; perchloride of mercury (1–2000), carbolic (1–40 or 1–60), iodine (5 per cent) are commonly used for this purpose. The throat is first swabbed with a dry swab, the application is then applied with a clean swab (p. 650). The nurse should protect her eyes whilst attending to the throat by wearing plain glass spectacles (p. 633). The drugs prescribed include cardiac stimulants and tonics. Adrenalin or strychnine may be ordered to be given hypodermically. Alcohol is given by mouth or by rectum (p. 60). The diet should be liquid and nourishing and may be given either hot or cold, whichever the patient finds the easier to swallow, and should consist of milk, egg-flip, meat jelly, albumin water, coffee, cocoa, etc. As soon as the patient can swallow with comfort semi-solid food is given and later increased to light solid diet.

In laryngeal and throat cases strict watch must be kept for symptoms of laryngeal obstruction, i.e. dyspnoea (p. 205), cyanosis (p. 188), pallor, stridor (p. 205), and retraction of the sternum (p. 206). Intubation or tracheotomy may become necessary at any moment in these cases, and a steam tent (p. 105) may be required. In nasal cases, the nose is douched (p. 648) or syringed (p. 648) with an antiseptic lotion such as quinine, eusol, etc. (For the treatment of conjunctival diphtheria see p. 631.) Paralysis (p. 361) may occur from the second week to the third month and is due to the toxin acting on the peripheral nerves. The soft palate is first attacked as a rule. The patient talks with a high nasal voice, food is

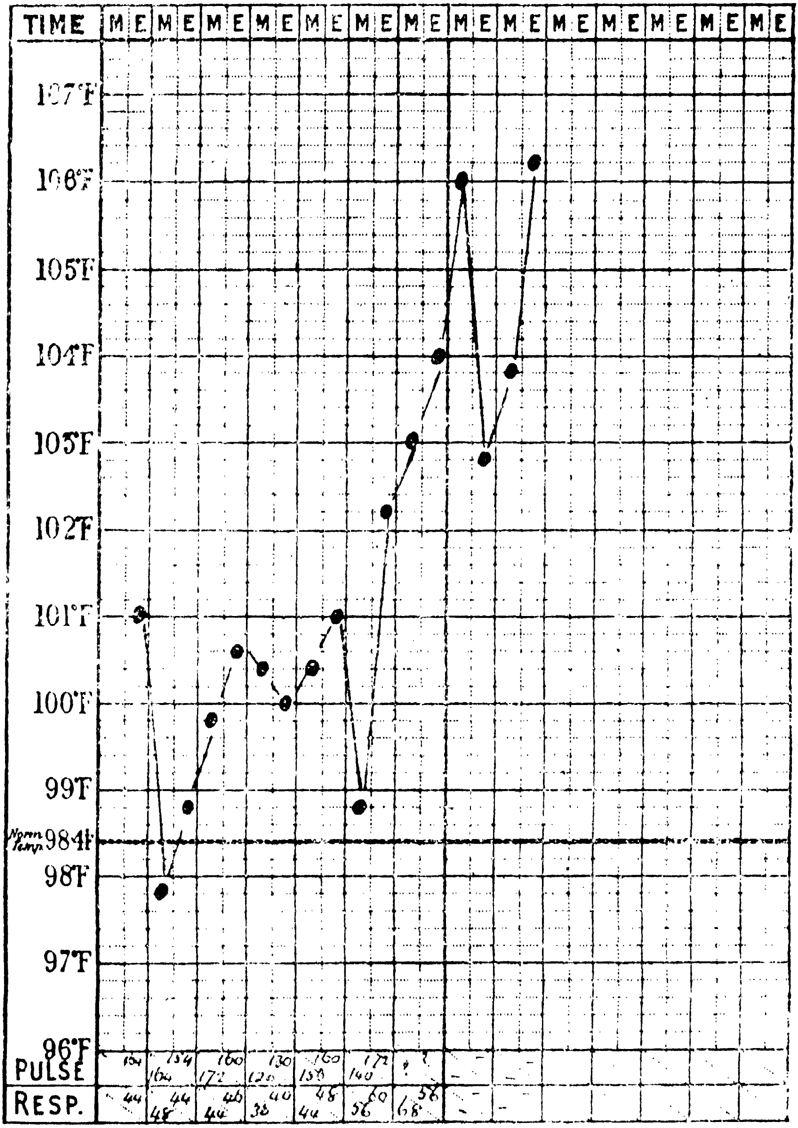

Fig. 177. Temperature chart of a case of cerebrospinal meningitis occurring in an infant.

regurgitated through the nose, or choking may occur. Other muscles commonly affected are the ciliary muscle, causing loss of power in accommodation; the muscles of the legs, causing partial loss of power, tingling, numbness, loss of knee jerks (p. 363), the external ocular muscles, causing squint (p. 642); less commonly the upper limbs and back may be affected. The heart is frequently irregular and death may occur due to paralysis at a late stage of the disease. In most cases the patient recovers from the paralysis in the course of a few weeks or months. Massage and electrical treatment is given. Inoculation against diphtheria is recommended.

The complications include: Albuminuria (p. 236); paralysis (p. 361); heart failure (p. 276); pneumonia (p. 251).

Period of isolation. — Until bacteriological examination gives negative results, i.e. the return of *three negative* reports.

Period of quarantine.—Twelve days.

Cerebrospinal Meningitis (Spotted Fever).—An acute infectious disease due to infection of the cerebrospinal system with the diplococcus intracellularis meningitidis, or meningococcus.

Mode of infection.—From contact with nasal secretion, also from sputum and discharges of pus that may be present. It may occur in epidemic form (p. 330); the germ may be found in the nasal secretion of a healthy individual who may transmit the disease without having it (see carrier, p. 317).

Incubation period.—Uncertain, about two to three days.

Symptoms.—The onset is sudden, with severe headache, pain in the back, rigors (p. 207), vomiting, giddiness, neuralgic abdominal pains, painful, spasmodic contractions in the muscles of the extremities, stiffness in the muscles of the back of the neck, and pyrexia. The temperature is irregular and in no way characteristic (see chart, Fig. 177). There is usually high fever, restlessness, delirium, or coma (p. 360). In some cases no eruption is present, in others, purpura, erythema, herpes (p. 416) about the mouth, or other eruptions may appear. The skin is hypersensitive, and there may be abnormal sensitiveness to light and sound. Kernig's sign (p. 363) is present. The head is retracted and squint (p. 642) may be present. Defervescence (p. 331) is gradual. Convalescence is slow. The duration of the disease may be several hours to several weeks.

Treatment.—Lumbar puncture (p. 86) is done as soon as possible and may be repeated several times during the course of the illness. Antitoxin serum is given. Local applications include an ice-bag (p. 92) to the head and spine, leeches (p. 103) or wet cupping (p. 104) to the back of the neck. Immersion in a hot bath (p. 116) twice a day may also be ordered. The diet should be liquid and as nourishing as possible. When the temperature is normal and vomiting ceases, light, solid diet is given. Rectal feeding (p. 60) may be necessary if vomiting persists. The chief drugs prescribed are those for the relief of pain; cardiac stimulants may also be ordered. The patient is nursed lying flat in bed and kept as quiet as possible, but needs to be gently turned from side to back every two hours to prevent hypostatic pneumonia (p. 251). The bed should be placed with the back to the light. Collapse (p. 562) must be guarded against, and if it occurs is treated according to instructions given by the physician. Means must be taken to guard against the formation of bedsores (p. 17). The bladder requires careful attention; retention or incontinence of urine may be present. Retention (p. 238) is relieved by catheter (p. 66). The urine should be measured until the patient is convalescent. The bowels need careful regulation either by aperients or enemata (p. 57) as ordered.

The complications are: Pneumonia (p. 251); pleurisy (p. 262); bedsores (p. 17); pericarditis (p. 274); hemiplegia (p. 377); paraplegia (p. 361); arthritis (p. 311); deafness; aphasia (p. 364).

Period of isolation.—Until the secretions have been proved to be free from the meningococcus.

Period of quarantine.—One week.

Influenza.—An acute epidemic disease.

Mode of infection.—By direct contact, fomites, and by air.

Incubation period.—One to four days.

Symptoms.—The onset is sudden, with shivering, rigors (p. 207), pyrexia (p. 195), lassitude, and pain in the head, back, and limbs. In uncomplicated cases the temperature falls to normal by lysis (p. 194) after a few days. The three chief types of the disease are the catarrhal, the abdominal, and the cerebral types. In the catarrhal type there is coryza (p. 659), cough, slight sore throat, or there may be bronchitis (p. 248), pneumonia (p. 251), or pleurisy (p. 262). In the abdominal type the chief symptoms are abdominal pain, vomiting, and diarrhoea. In the cerebral type there is acute headache, vomiting, delirium (p. 359), or coma (p. 360).

Treatment.—Rest in bed until the temperature is normal is essential. The diet should consist of light nourishing food, with 4–6 pints of fluids, until the temperature becomes normal, then a liberal diet. In the abdominal type the diet is restricted to diluted milk or albumin water until the sickness ceases. The drugs ordered may include sulphapyridine (M & B 693), quinine, aspirin, phenacetin, and salicylates. In cerebral cases hypnotics may be necessary. Respiratory and abdominal symptoms are treated if present. Severe depression may be present during convalescence.

Period of isolation.—Until convalescent.

Period of quarantine.—Five days.

Mumps (Parotitis).—An infectious disease marked by inflammation of the parotid gland and in some cases inflammation of the testes (*orchitis*), ovaries, pancreas, or the mammae.

Mode of infection.—By direct contact and fomites.

Incubation period.—Two to four weeks, usually eighteen days.

Symptoms.—The chief symptom is pain in the jaw accompanied by slight fever. After one or two days there is marked swelling of the gland. The swelling may be very tender, and there may be difficulty in opening the mouth, with pain on swallowing. Both sides may be affected simultaneously or successively and the submaxillary and sublingual glands may also be involved. The glands gradually regain their normal size in a few days, or two or three weeks.

Treatment.—Rest in bed is necessary until the swelling has disappeared. Local applications consist of fomentations (p. 90) and frequent hot antiseptic mouth washes (p. 15). The bowels should be kept freely open. The diet should be liquid or soft during the painful stage; but as soon as the pain is less, a generous diet should be given. Draught and cold must be avoided until the patient is quite convalescent.

Period of isolation.—Three to four weeks, and only when one week has elapsed after the subsidence of the swelling.

Period of quarantine.—Twenty-four days.

For parotitis occurring after abdominal operations, etc. see p. 516.

Whooping-cough (Pertussis).—A disease characterized by a spasmodic cough marked by a whoop during inspiration caused by the Bordet-Gengou bacillus.

Mode of infection.—Through the sputum, the breath, and sometimes by fomites.

Incubation period.—Variable, about fourteen days.

Symptoms.—The period of invasion, or catarrhal stage, commences with the symptoms of a feverish cold—coryza, slight fever, cough, and bronchial catarrh. This stage lasts about a week or ten days and is the most infectious period. The second stage is known as the paroxysmal stage. The cough, instead of improving, becomes more paroxysmal. It may occur suddenly without apparent cause, or may be excited by emotion, fright, or excitement. It commences with several short coughs in rapid succession, the face becomes livid, the veins distended, the eyeballs protrude; just as the patient appears on the verge of suffocation, a deep inspiration takes place with a whoop or crowing sound and the condition rapidly improves. Mucus may be expectorated, or vomiting may occur. The temperature is normal. The second stage may extend over weeks or months. The third stage is that of convalescence, the paroxysm gradually becomes less severe and less frequent and the whoops cease.

Treatment.—If the attack is severe the patient is kept in bed until the temperature is normal. When the second stage develops the patient should be allowed up and kept out of doors as much as possible. Warm but light clothing is necessary and cold east winds and rain must be avoided. *Drugs.*—Vaccine treatment may be of use in checking the attack. Belladonna is considered to be a specific remedy; chloretone is also of value; ipecacuanha wine may be ordered if there is much mucus present which the child is unable to cough up; cod-liver oil and malt is of value during convalescence. A vaporizer may be used in the room at night. Good food is essential; the child should be given as much nourishment as he can take. The head should be supported during a violent paroxysm of coughing. The child should not be allowed to mix with other children. Change of air is often beneficial. Adults may contract the disease.

Period of isolation.—Six weeks after the commencement of the second stage, or until all cough has ceased. The isolation necessary is that given under contagious diseases (p. 316).

Period of quarantine.—Three weeks.

Malta Fever.—An endemic (p. 330), and sometimes epidemic (p. 330), infectious fever due to infection with the micrococcus melitensis.

Mode of infection.—By mosquito bites. contact with infected goats and cattle when the skin is broken, and by drinking infected goats' milk.

Symptoms.—The onset is gradual, with headache, anorexia, insomnia, vomiting, constipation, slight cough, and profuse perspiration. The acute symptoms gradually pass off after a week or two, but the disease follows a very tedious course. There is progressive loss of flesh and strength with profuse sweating and pyrexia. The temperature may become normal over and over again and rise again gradually as in enteric (p. 341), or it may be intermittent (p. 195), the drop in temperature being associated with sweating. In the malignant type the onset is sudden, the temperature high and remaining so, the typhoid state (p. 210) ensues and ends in death.

Treatment.—Vaccines are of considerable value. Alcohol is usually ordered and cardiac stimulants may be necessary. Liquid diet is given during the stages of pyrexia, including liberal glucose drinks; in between or when the temperature is normal, light solid diet is allowed. The patient must be fed up as much as possible and his strength maintained in every way. He should be sponged all over twice a day, cold or tepid sponging (p. 111) is given for the hyperpyrexia (p. 195). When sweating is profuse frequent changes of the garments and sheets should be made. A frequent change of blankets and mattress is also desirable. Means must be taken to guard against bedsores (p. 16). Other symptoms are treated as they arise.

The complications include: Arthritis (p. 311); rheumatism (p. 309); neuritis (p. 365); orchitis (p. 354).

Period of isolation.—Until convalescent.

Period of quarantine.—Two weeks.

Vincent's Angina.—A subacute tonsillitis with slight general symptoms, characterized by ulcerative inflammation, and generally supposed to be due to infection by the bacillus of Vincent. Occurs chiefly in children and debilitated subjects who are overworked or in insanitary surroundings.

Incubation period.—About six to seven days.

Symptoms.—The onset of the disease is insidious, and there may be so little complaint of the throat that attention is only directed to it by the accompanying glandular enlargement. The disease is ushered in with headache, malaise, coated tongue, anorexia, and pains in the back. The temperature rarely exceeds 101° F. and may remain normal throughout. The glands at the angle of the jaw are enlarged and tender on the affected side. Foetor of the breath is generally present and is characteristic.

Treatment.—The ulcerating surface is painted once or twice a day with pure tincture of iodine after cleansing with peroxide of hydrogen (5–10 vols. per cent). Salvarsan powder may be applied locally in obstinate cases, or it may be given by intravenous or muscular injection. Cleansing and disinfection of the mouth will be required, and rest, fresh air, and tonic treatment are important. Most cases recover in seven or fourteen days, but relapses are not uncommon.

CHAPTER IX

THE NURSING OF DISEASES OF THE NERVOUS SYSTEM

Nursing.—In the nursing of nervous diseases the remarks already made under medical nursing will apply, but in addition, the nurse requires to be extremely tactful, sympathetic, encouraging, yet firm. It is to be borne in mind that patients suffering from disease of the nervous system are frequently irritable, irritating, and have not complete control over their emotions, their whole personality being commonly altered by the condition. The disease is often very chronic, and the patient is liable to become discouraged and give up making any effort to get well; the nurse must therefore be firm in carrying out the physician's orders, and at the same time not judge the patient too hardly but be ready to make allowances, remembering that the mind as well as the body is affected by the disease. A word of caution is required in the nursing of functional disease of the nervous system (p. 385), as in many cases nurses are not taught the proper meaning of the word *functional* and are therefore apt to use it in a wrong sense and to put a wrong construction upon it. A functional disease is one in which no organic or structural changes are found, but in which the function of the affected part is interfered with. It is just as much a disease as an organic disease, and cannot be prevented by the patient. The nursing point to remember is that many functional diseases are curable, whereas the majority of organic ones are not. Patients suffering from functional disease of the nervous system are not malingerers and are in need of the same careful nursing, sympathy, and treatment as if they were suffering from functional disease of other organs, as for instance of the heart, palpitation (p. 276), of the kidney, functional albuminuria (p. 236). Hysterical (p. 392) and hypochondriacal (p. 394) patients frequently exaggerate their symptoms and imitate other diseases and require very firm handling; at the same time it should be remembered that if they were in normal health these symptoms would not appear. A little judicious sympathy will often help to effect a cure when other means fail.

Treatment.—The general treatment consists mainly of rest, fresh air, and healthy interest or occupations. Nourishing food in abundance is more essential in these cases than in almost any others. The diet should be generous unless sickness is present, extra milk, butter, eggs, fat, etc., are given. When possible the patient is weighed once a week; steady increase in weight is one of the most favourable symptoms (see table of weight and height, p. 846). Massage, electrical treatment, and graduated exercises form an important part of the treatment, for which see Chapters XXIV and XXV. *Drugs.*—Tonics are usually prescribed, aperients are often required, and hypnotics (p. 767) are frequently necessary to start with, but are given with caution in order that the patient does not rely on them. Particular care is required in the prevention of pressure sores (p. 18), which are very liable to occur, especially in cases of paralysis (p. 361). Paralysed limbs should be kept warm, scrupulously clean, and maintained in good position in order that contractures (p. 362) do not occur and cause deformity. These patients are particularly susceptible to burns, therefore hot bottles should be efficiently covered and placed in the bed in such a position that they cannot come into contact with the limbs or body (see hot bottles, p. 19). Patients suffering from incontinence of faeces or urine should be nursed on a water bed (p. 22), or solid rubber mattress, Sorbo or Dunlopillo (p. 23), or water pillow (p. 23), or on a divided mattress (p. 23), with a bedpan covered with a rubber ring cushion (p. 23) left in position. Paralysed patients should have their positions in bed changed every two hours in order to prevent the occurrence of bedsores (p. 18), hypostatic pneumonia (p. 251), etc. (For further nursing see medical nursing, p. 212.)

The following symptoms may occur in connection with these diseases, others not mentioned here have been described in Chapter V:

Insomnia is inability to sleep. The condition may be acute or chronic. Acute insomnia may be due to pain, fever, shock, or may be preliminary to insanity or delirium tremens (p. 359). In acute cases drugs will probably be prescribed and should be given the last thing at night after the patient has been settled comfortably, absolute quiet being then maintained (p. 9). Sleep should be timed by the clock, it must also be noted whether it is consecutive or broken. The patient's account should be noted but should not be taken as reliable; neither should it be commented on in his hearing. In chronic cases the following means may induce sleep without resort to drugs: raising the head, applying heat to the extremities; a mustard leaf (p. 94) or rubber hot bottle to the epigastrium; a hot drink; massage (p. 745); sponging the hands and face with warm water; a wet pack (p. 110), or foam baths (p. 115). Drugs should never be given for insomnia without the doctor's orders and should not be continued unless the patient is under medical advice.

Delirium is an acute disorder of the mental faculties. It may be either of the low muttering type or a wild and noisy delirium. Low muttering delirium is marked by disconnected, irrational speech, restless impulses, and impaired will and motor power. In mild cases the delirium is intermittent and the patient may be roused to answer questions sensibly. In more severe cases the delirium is constant, the patient is insensible to his surroundings, and does not recognize his friends. Incontinence of faeces and urine may be present. This type is found in prostrating fevers and illnesses and in the typhoid state (p. 210). Wild delirium is one of intense excitement, the patient is noisy, violent, difficult to control, and insensible to his surroundings. The eyes are wide open, pupils dilated, the face is flushed, and the speech incoherent and rapid. The condition is usually associated with toxic conditions due to bacterial infection (p. 832), and may be due to uraemia (p. 238), alcohol (p. 550), thyrotoxicosis (p. 298), and certain drugs (see Chapter XXVII), or follow some surgical operation.

Treatment.—Hypnotics (p. 767) and narcotics (p. 768) are prescribed. The patient's general health is supported by regular nourishment. The poison is eliminated or neutralized if possible. Enforced restraint may be necessary, also nasal (p. 55) or oesophageal feeding (p. 54).

Delirium Tremens, or alcoholic delirium, is the most acute form of delirium. It always results directly from prolonged or excessive alcohol drinking; it may be precipitated by an accident, acute illness, or enforced abstention from alcohol.

Symptoms.—Loss of appetite and sleeplessness are the first symptoms. After a restless night the patient has a furred tongue, much tremor (p. 361), and his ideas are confused and changing; no food is taken, and as night approaches delirium supervenes. Little or no sleep is obtained, the patient spending the night in perpetual, restless, fussy delirium. The following day is spent in the same way; food, and probably drink, is refused. The delirium becomes more violent; the patient is noisy, abusive, and constantly spits over the bed, the attendants, room, etc.; his ideas become more fixed, his actions more violent, tremor is increased, and he becomes obviously weaker. If sleep can be obtained and food is taken, the patient will stand a good chance of recovery but not otherwise.

Treatment.—From the commencement drugs to induce sleep will probably be prescribed. Great difficulty may be experienced in getting the patient to take medicine; it may sometimes be disguised with success in stout, failing this, hypodermic injections

(p. 84) will have to be resorted to. Every effort should be made to induce the patient to eat; any kind of food may be given and meat or soup should be well peppered with cayenne pepper. Cayenne may also be put in the tea. Some stimulant will probably be prescribed, the most usual being bottled stout. In the early stages only untiring patience will induce the patient to take food or to remain in bed. It must be remembered that every suggestion is new to the patient, as his memory does not carry him back beyond a few seconds. In the more violent stage, forcible restraint will be necessary to prevent him harming others and himself; there is often a suicidal tendency. A strait-jacket should be applied before the violent and unmanageable stage is reached, this of course is not done without the physician's orders except in an emergency. If the patient is suffering from a fracture or injury, care must be taken to protect the limb or injured part from further injury which may result from the patient's violent movements. A limb should be slung in a Salter's cradle (Fig. 178) instead of being fixed to the bed. Food and drugs may have to be administered by oesophageal feeding (p. 54).

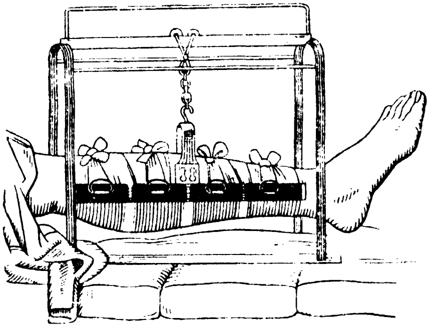
FIG. 178. Salter's Cradle.

The complications include: Bronchitis (p. 248), pneumonia (p. 251), renal disease (p. 241), and heart failure (p. 276).

Hallucination.—A false sense perception. It is the perception of an object or phenomenon which has no external existence, as hallucination of sight, sound, smell, taste, or touch. *Lilliputian* hallucination is of brief duration in which the patient sees diminutive human figures about eight inches in height, generally arranged in groups, and exhibiting great vivacity. Hallucination commonly occurs in many forms of delirium, some nervous diseases when delirium is absent, and is a common symptom in many forms of mental disease.

Coma is a condition of unconsciousness. The patient appears to be in a deep sleep; delirium may also be present. Coma may be caused by toxaemia (p. 577), diabetes (p. 289), hypoglycaemia (p. 291), drugs (p. 758), shock (p. 561), haemorrhage (p. 563), exhaustion, and is a common symptom in diseases of the brain, in which case it is frequently accompanied by stertorous breathing

(p. 205); it occurs commonly before death, and in many instances may be taken as a sign of approaching death (p. 207). **Coma-vigil** is a state of coma in which the eyes remain wide open, the pupils are dilated, and low muttering delirium (p. 359) may be present. It occurs in prostrating diseases, in the typhoid state (p. 210), and is constantly present in typhus fever (p. 338).

Paralysis.—By paralysis is meant the loss of voluntary power of movement. With it there may be associated a loss of sensation, or altered sensation, though this is not invariably the case, nor is the abnormality of sensation always on the same side of the body as the paralysis. (For abnormalities of sensation see p. 363.) Slighter degrees of loss of power are described as *paresis*. Paralysis involving one side of the body is called *hemiplegia*; paralysis of the lower limbs, with or without paralysis of the trunk, *paraplegia*; paralysis of one limb, *monoplegia*. Local paralysis of the muscles supplied by any nerve is named after the nerve affected, as, for instance, musculo-spiral paralysis (p. 367). Paralysis may be caused by disease or injury affecting any part of the nervous system, from the nerve-cells in the grey matter of the convolutions of the brain where the impulses originate, to the terminations of the nerves in the muscular fibres by which that impulse is conveyed to the muscles (for nursing see p. 357).

Ataxy, or *inco-ordination*, is a disorder of muscular movements often the result of damage to afferent nerve-fibres. It may also be due to disease of the co-ordinating centre, or to disease of afferent nerves from other structures than muscles, such as the semicircular canals. Nearly all movements of the body involve several muscles, and if the degrees of contraction of these different muscles do not bear the normal proportion to one another, the resulting movement is disordered, or *ataxic*.

Spasm, or excessive muscular contraction, is a common symptom of disease of the motor nerves. Spasm may be tonic (continuous) or it may be clonic (intermittent and rhythmical).

Tremor, or trembling, occurs under many different circumstances in health and disease. It may be a transient symptom resulting from cold, emotion, or excitement, i.e. shivering (p. 208). Asthenic tremor may result from severe exercise of certain muscles, as, for instance, in the arm and hand after carrying a heavy load. Tremor occurring on movement is seen in conditions of feebleness such as may follow acute diseases. In certain diseases tremor may accompany voluntary movement, and is called *intention tremor*, it occurs in disseminated sclerosis (p. 379) and tumour of the brain. *Toxic tremor* occurs in chronic poisoning by lead, alcohol, mercury, thyrotoxicosis (p. 298), etc., and may be present with voluntary movement only, or independent of movement, or in the early stages with voluntary movement, later becoming continuous. *Senile tremor* occurs in old age, and usually affects the head and arms. *Simple tremor* begins at puberty or later, and may persist through life; the condition is sometimes hereditary (*hereditary tremor*).

Fits or Convulsions are sudden and violent involuntary muscular contractions. They occur in many diseases and conditions, and in children may be brought about by trifling causes, see p. 588. Fits occur commonly in the following diseases: eclampsia (p. 702); uraemia (p. 238); epilepsy (p. 385); Jacksonian epilepsy (p. 385); diseases of, or injuries to, the brain (p. 545); heart block (p. 273); tetany (p. 300); tetanus (p. 582); and may take the place of a rigor in children suffering from acute infectious disease.

The nurse's duties during a fit are:

(1) To secure the safety of the patient by attention to the tongue, keeping the airway free and preventing the aspiration of mucus into the lung; to prevent the patient injuring himself in his movements.

(2) To screen the patient from the sight of others.

(3) To observe and make note of what takes place during the fit.

Note should be made of the following points:

Whether the fit was preceded by a cry. In which part the twitching commenced and the method of its spreading. Whether the eyes were turned to one side and if so whether the head was turned with them. Whether the tongue was bitten. The colour of the face whether changed, either flushed, pale or blue. Whether the patient was unconscious, and if so whether speech was lost before unconsciousness. Whether incontinent of urine. The duration of the attack and any symptoms following the fit, i.e. drowsiness, coma, automatic movements (p. 388), etc. (For full description of fits see first aid, p. 547)

Contracture is the shortening of a muscle which follows a long-existing, unopposed tonic spasm (p. 361). Contractures occur commonly in connection with paralysis, and in many cases may be prevented by maintaining the limb in correct position until the paralysed muscles recover.

Nutrition.—Changes and disturbances of nutrition are frequently associated with disease of the nervous system. They consist chiefly in atrophy (p. 192) of the muscles, changes in the joints, and alteration in the skin and its appendages. The body may be emaciated and wasted generally. Changes in electro-muscular contractility are of common occurrence: electrical reaction may be normal, increased to both currents, diminished to both currents, or the reaction of degeneration (R.D.) may be present (p. 740).

Trophic Affections of the skin include herpes (p. 416), scleroderma, and glossy skin. *Acute decubitus* is the name given to an acute bedsore appearing in a few days or hours on parts subjected to pressure in patients suffering from a severe cerebral or spinal lesion (p. 367). *Chronic decubitus* is the term applied to bedsores which ultimately appear on parts subjected to pressure in the course of chronic spinal and brain disease or prolonged debilitating conditions as typhoid fever (p. 341). (For the description, treatment, and prevention of bedsores see p. 17.) *A perforating ulcc* (p. 573) of the foot is an undermining ulcer which occurs in some nervous diseases such as locomotor ataxy (p. 371). Trophic affections of the hair and nails are as follows: The nails may become hard, dry, brittle, discoloured, and their growth may be arrested. There may be loss of hair (*alopecia*), an overgrowth of hair on the skin of the affected part (*hirsuties*), a change in the colour of the hair.

Sensory Changes.—Sensory changes occur very commonly in connection with diseases of the nervous system when the sensory nerves are affected. *Anaesthesia* is loss of sensation; *hyperaesthesia* is exaggeration of sensation; *paraesthesia* is disordered sensation such as tingling, pins and needles, etc.; *analgesia* is loss of sensation of pain; *hyperalgesia* is an exaggerated sense of pain; *allochiria* is a disorder of sensation in which the patient refers the pain to a point on the opposite side of the body from that to which the stimulus is applied.

Reflex Action.—Changes in reflex action are frequently present in diseases of the nervous system. The reflexes are divided into three groups: (1) Tendon, deep, or muscle reflexes; those most usually tested are the *knee jerk* or *patella tendon* reflex, which is always present in health; the *ankle clonus*, which is not normally present. **Kernig's Sign**, when the thigh is flexed, rigidity of the flexor muscles of the knee prevent the knee joint from being extended. (2) The superficial or cutaneous reflexes: the *plantar reflex*, in health the big toe is flexed; **Babinski's Sign** is the name given to an extensor response; the cremasteric, gluteal, abdominal, and epigastric reflexes, which consist in contraction of the underlying muscles when the skin is stimulated, these are present in health; the **conjunctival reflex** and the dilatation of the pupil which follows stimulation of the skin of the back of the neck, present in health. (3) Organic or visceral reflexes are those connected with the functions of micturition, defaecation, deglutition, contraction of the pupil to light, etc.

Disturbance of Speech may result from disease of the neurones of the path to the muscles concerned in articulation. The patient uses the correct words and arranges them in correct order, but he cannot pronounce them correctly; thus paralysis of the tongue interferes with the pronunciation of the letters *l* and *t*, and paralysis of the lips, *p* and *b*. This condition is called *anarthria* or *dysarthria*. *Aphasia* is a disorder of speech arising from disease of the cerebral hemisphere. Motor aphasia is the loss of power of giving expression to thoughts either by speaking (*aphemia*), or by writing (*agraphia*). Sensory aphasia is the loss of power of understanding language, either on reading it (*alexia*, word-blindness), or hearing it (word-deafness). Conduction aphasia is a condition in which the patient has a difficulty in recalling words (*verbal amnesia*), and often uses the wrong words (*paraphrasia*).

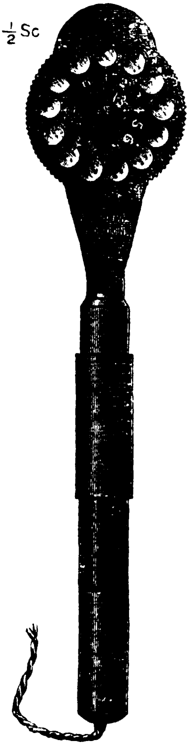

FIG. 179. Ophthalmoscope.

Tinnitus.—A subjective ringing, roaring, or hissing sound heard in the ears. It is often present in aural diseases (p. 656), it may occur in nervous diseases, and is present in intoxication by quinine, salicylate of soda, aspirin, and other drugs.

Requisites for examination of the nervous system.—The following things should be in readiness when a patient suffering from disease of the nervous system is to be examined by the physician. The patient should be in bed. Dressing-gown and slippers; hand lamp or eye lamp; ophthalmoscope (Fig. 179); tuning fork (see Fig. 233); pin-cushion containing sharp pins; small piece of dry cotton wool; two test tubes, water, spirit lamp, matches (when needed, the test tubes are half filled with water, one is boiled over the spirit lamp, the other is handed cold); wooden stethoscope or tendon hammer (Fig. 180); pencil and paper; skin pencil; small bottles for testing the sense of smell, containing peppermint, cloves, cinnamon, whisky; condiments for testing the sense of taste, i.e. sugar (sweet), salt (salt), citric acid (sour), and quinine (bitter); galvanic and faradic battery; two dry towels and hot salt solution; a specimen of the patient's urine.

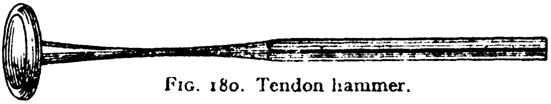

FIG. 180. Tendon hammer.

DISEASES OF NERVES

Neuritis is inflammation of a nerve; it may be acute or chronic, and may involve one (local) or several (multiple neuritis) nerves. Inflammation of the sheath is called perineuritis; of the interstitial tissue, interstitial neuritis; and of the nerve fibres, parenchymatous neuritis.

Causes.—Regional neuritis may be due to local injury, pressure, or inflammation from some neighbouring focus; it is usually interstitial. Multiple neuritis is generally due to an abnormal condition of the blood, and is of the parenchymatous type.

Symptoms.—In acute local neuritis there is often no constitutional disturbance. There is pain in the nerve and in its area of distribution. The pain is severe and becomes worse at night and is increased by tension on the nerve. The overlying skin may be red, oedematous, and hyperaesthesia (p. 363) or anaesthesia (p. 363) or both may be present. Herpes (p. 416) often occurs. The muscles supplied by the nerve lose their power, become flabby, and show fibrillary twitchings. Tenderness on pressure is present, and electrical reactions (p. 740) are altered. In chronic cases the symptoms are similar but less severe, and trophic changes (p. 363) of the skin and joints are frequent. Adhesions may develop in the joints and the hair and nails may stop growing.

Treatment.—The cause is treated. A mercurial aperient is usually prescribed, also a diaphoretic (p. 767). The inflamed part is kept at rest and the pain is relieved by fomentations (p. 90). Hypodermic injections of cocaine (p. 84) are sometimes prescribed if the pain is very severe; the cocaine is injected over the affected nerve. After the acute stage is passed, massage and electrical treatment are given (see Chapters XXIV and XXV).

Multiple Neuritis, or Peripheral Neuritis.—*Causes.*—The causes include: Poisoning by lead, arsenic, or alcohol: toxaemia (p. 577) following acute infections such as diphtheria (p. 349), septicaemia (p. 575), small-pox (p. 334), beri-beri (p. 303); or reduced vitality associated with senility, exposure, diabetes (p. 289), hypovitaminosis (p. 302), etc.

Symptoms.—The symptoms vary with the cause. In alcoholic neuritis the onset is gradual and commences with pain and tingling in the lower limbs. Later, the pains become more severe, ankle drop is present owing to weakness of the muscles of the front of the leg, and walking or standing is impossible owing to loss of power, inco-ordination (p. 361), and plantar tenderness. The skin is livid and hypersensitive, the muscles are tender, and oedema (p. 190) may be present. The muscles waste and their electrical reactions (p. 740) are altered. Later, the upper limbs usually become affected. Mental symptoms are common, and include general enfeeblement, loss of memory, and delirium (p. 359). The bowels and bladder are not incontinent except in severe mental cases.

Acute Febrile Polyneuritis sometimes follows exposure to cold or over-exertion, or may be induced by the toxins of septicaemia, lead poisoning (p. 383), influenza (p. 353), etc. *Symptoms.*—The onset is acute and commences with shivering, pain in the head and limbs, and a rise of temperature. Later, swelling of the affected limbs may be present with symptoms of damage to the motor and sensory nerves of the limbs. In severe cases the trunk is involved.

General treatment of multiple neuritis.—The cause is treated. Absolute rest in the recumbent position is essential, with abundance of light nourishing food. In alcoholic neuritis, all alcohol is forbidden. Severe pain may be relieved by fomentations (p. 90), anodyne liniments (p. 95), applications of methyl-salicylate, or hypodermic injections of cocaine. Morphia may be necessary for the relief of acute pain. If the intercostal nerves are affected the chest may require to be strapped (p. 536) on the affected side. From the outset it is most important to guard against any deformity which may result from wrist or foot drop, contracture from flexing the knees, or other contractures (p. 362), by maintaining the affected limb in correct position by means of sand-bags, splints, or other suitable appliances. A cradle should always be used when the feet or legs are affected. In the later stages, massage and electrical treatment are given; still later, passive then active exercises. Hyperthermia (p. 113) may prove effective. The drugs prescribed include strychnine, cod-liver oil, and tonics. Salicylates may be prescribed for cases due to exposure or cold, and perchloride of iron in large doses for septicaemic cases. Convalescence is usually very slow and relapses are common. Death may occur from pneumonia (p. 251) or bronchitis (p. 248) when the phrenic, intercostal, or other respiratory nerves are affected. Permanent disablement may result if the nerves are irretrievably damaged or if deformity is allowed to develop.

AFFECTIONS OF SPECIAL NERVES

Sciatica is a painful condition of the sciatic nerve. Neuritis of the nerve-sheath is present and may extend to the interstitial tissue or damage the nerve fibre.

Causes.—Gout (p. 312), exposure to cold and wet, and pressure are common causes. It may also be secondary to pelvic tumours or pelvic inflammation, injury during labour (p. 691), disease of the hip joint (p. 615), or occur as part of a multiple neuritis.

Symptoms.—The chief symptom is pain in the sciatic nerve and its branches. Tenderness is present, and may extend from the sciatic notch to the outer border of the foot; it is especially marked at the lower border of the gluteus, the middle of the thigh, the popliteal space, below the head of the fibula, and behind the external malleolus. Any posture that causes tension on the nerve increases the pain. There is very slight muscular wasting in most cases. The pain may be constant and very severe or it may be neuralgic and of short duration.

Treatment.—In the acute cases absolute rest in bed is essential. Fomentations (p. 90), blistering (p. 95), and hypodermic injections of cocaine (p. 84) may be prescribed for the relief of pain. A sterilized needle inserted into the most painful site and left in position for ten or fifteen minutes is sometimes successful in relieving pain. Galvanism (p. 741) and massage (p. 745) are given in the less acute cases. Hyperthermia (p. 113) has proved effectual in many cases. In obstinate cases the limb may be fixed on a Liston long splint (p. 157), which frequently relieves the pain; or the nerve is sometimes stretched (p. 471) under an anaesthetic (p. 446). In the acute cases morphia may be necessary. The bowels should be kept in a relaxed condition, as constipation may cause an attack of pain.

The **Musculo-Spiral (Radial) Nerve** may become inflamed as a result of an injury, blow, or pressure. Pressure from the use of a crutch causes a condition known as *crutch paralysis.* Pressure from falling asleep with the arm stretched over the back of a chair is a form which occurs commonly in persons who have been indulging in alcohol and are, therefore, sleeping too soundly to be wakened by the tingling of the nerve; it may also occur when a patient is under an anaesthetic if the arms have not been carefully placed (p. 454).

The **Facial Nerve** may be affected by cold, damp, and draught; by disease of the mastoid process; or after operations on the ear. Other local nerves may be affected either through injury or disease, the treatment being that already described under local neuritis.

DISEASES OF THE SPINAL CORD

Spinal Meningitis, or inflammation of the coverings of the cord, may involve the pia mater and arachnoid (leptomeningitis), or the dura mater (pachymeningitis). It may be acute or chronic, diffuse or localized, and is called external or internal according to whether the inflammation starts outside or inside the dura mater.

(*a*) **Acute Internal Meningitis.**—*Causes.*—It may be part of a cerebrospinal meningitis (p. 352), or may occur in pneumonia (p. 251) and other infectious diseases such as diphtheria (p. 349), gonorrhoea (p. 324), enteric (p. 341), etc.

Symptoms.—The onset is acute, with rigors (p. 207), fever (p. 195), and pain in the back. Spasm is present, especially in the muscles of the back, and is aggravated by movement and pressure. There is cutaneous hyperaesthesia (p. 363), constipation (p. 186), retention of urine (p. 238), followed by some loss of power and sensation (p. 361).

Treatment.—Absolute rest of mind and body is essential. The room should be darkened and kept as quiet as possible. The application of leeches (p. 103) or fomentations (p. 90) to the spine may be ordered. Drugs to relieve the pain and spasm, hot-air baths (p. 112), diaphoretics (p. 767), and mercurial inunctions (p. 97) are also prescribed. A mercurial aperient is ordered at the outset. Later, counter-irritation (p. 95), massage (p. 749), electricity (p. 740), tonics, and change of air are prescribed. Acute cases may die within a week. Convalescence is very prolonged. In chronic cases the onset is gradual. The chief symptoms are pain and stiffness of the back. The treatment is that described in the later stages of the acute form.

The complications include: Bedsores (p. 17), cystitis (p. 245), exhaustion, heart failure (p. 276), and interference with respiration.

(*b*) **External Meningitis.**—The disease is almost always fatal. The inflammation involves the dura and the connective tissue between it and the bone, the space becomes filled with pus. The symptoms resemble those of internal meningitis, only they are more acute. The treatment is that already given. In chronic cases extension (p. 150) may be employed, or laminectomy may be performed (p. 491).

Spinal Meningeal Haemorrhage. — *Causes.* — Injury, purpura (p. 286), aneurysm (p. 278), and epilepsy (p. 385) are among the chief causes.

Symptoms.—The symptoms are not always definite, but sudden and severe pain in the back, muscular spasm, and retention of urine (p. 238) may be present.

Treatment.—Rest in bed either in the prone (p. 26) or lateral (p. 677) position is essential. Ergotin (p. 844) is injected as a haemostatic, and morphia (p. 774) for the relief of pain. Ice-bags or ice poultices (p. 93) and leeches (p. 103) are applied to the spine. Death commonly results from haemorrhage (p. 563).

Myelitis, or Inflammation of the Spinal Cord.—*Causes.*—The condition may be due to exposure when the body is heated; to injury or disease of the spine; to the toxins of infectious diseases, such as diphtheria (p. 349), small-pox (p. 334), syphilis (p. 322), gonorrhoea (p. 324), typhus (p. 338), etc.

Symptoms.—The onset may be acute, subacute, or chronic. Acute transverse myelitis is the most common form. The onset occurs with headache, shivering, the general symptoms of fever, and tingling and sensory disturbance of the limbs (p. 363). Later there is weakness in the limbs and finally paralysis of the lower limbs and trunk (see paraplegia, p. 361). Sensation is completely or partially lost below the lesion in the cord. There is incontinence of urine and faeces, or retention of urine may be present with overflow incontinence (p. 238). Bedsores form easily and very rapidly (see acute decubitus, p. 363). Cystitis (p. 245) commonly occurs, and may be partly due to trophic changes (p. 363) and partly to catheterization (p. 66). The general symptoms may be severe and include high fever, a dry tongue, and delirium (p. 359).

Treatment.—In ascending myelitis it will be necessary to prop the patient up with a bedrest or pillows to relieve dyspnoea, which supervenes as the chest muscles become affected. A water or solid rubber bed (p. 22) is a necessity, and the patient's position should be changed frequently. Every means must be taken to prevent the formation of bedsores, which may occur in spite of the most careful nursing (p. 17). The bowels are opened by enemata (p. 60) if necessary. Catheterization must be regularly and carefully performed; if cystitis is present the bladder is washed out daily (see bladder lavage, p. 70). Digestible, nourishing food should be administered in as large a quantity as can be taken, the diet is not restricted to liquids unless the temperature is very high. Drugs may be required for the relief of pain which is often very severe. In the later stage, massage and electrical treatment are given (see Chapters XXIV and XXV). Death may occur as a result of toxaemia (p. 577) due to bedsores or cystitis. In ascending myelitis, the paralysis spreads upwards, and in severe cases death may occur within a week from paralysis of vital organs.

Landry's Paralysis, or Acute Ascending Paralysis.—A disease marked by motor paralysis which spreads from the lower limbs to the trunk, upper limbs, and respiratory muscles.

Causes.—Acute infections, syphilis (p. 322), alcoholism (p. 381), and septic wounds may be causes.

Symptoms.—Feverishness, malaise, and numbness in the extremities occur. The most marked symptom is weakness in the legs, which progresses rapidly, so that within a few hours or days their power is lost. The paralysis extends up to the abdomen, chest, and upper limbs, and often to the neck; the patient cannot move; defecation is difficult, and respiration, deglutition, and articulation are embarrassed. The sphincters are not affected. Sensation is normal or very little impaired, and there is no pain. The affected muscles are flaccid but do not waste; reflex action (p. 363) is lost and electrical reactions (p. 740) are normal. Pyrexia is not present after the first few days. The majority of cases end fatally, many dying within the week, others progress more slowly. In a few patients the disease is arrested when it reaches the arms, and after remaining stationary for some time the paralysis recedes in the reverse order to that in which it spread, but many months may elapse before the muscles regain their power. The treatment is that given under myelitis (p. 369).

Diver's Paralysis, or Caisson Disease.—A disease occurring in persons who are subjected to much more than normal atmospheric pressure, such as divers.

Symptoms.—The chief symptom is pain in the limbs, especially the knees, known as 'bends,' which may be slight or intensely severe. Paralysis, commonly paraplegia (p. 361), with loss of sensation (p. 363) and retention of urine (p. 238), is usually present. The paralysis may be slight and pass off within a few hours, or it may continue for several months. In a few cases hemiplegia (p. 377) occurs, and in some coma (p. 360) supervenes within a few hours and ends in death, but the majority of cases recover.

Treatment.—The treatment is that described under general treatment (p. 357). Morphia is given for the relief of pain.

Compression of the Spinal Cord may arise from tumours, disease of the vertebrae, abscesses, etc. The treatment is surgical (see operations on the spine, p. 491, also Pott's disease, p. 618).

Syringomyelia.—A disease of the spinal cord in which cavities are formed; they may be produced by some congenital defect, or be due to new growth of the cord such as glioma, etc.

Symptoms.—The symptoms may be ill-defined or absent. The most characteristic symptoms are analgesia (p. 361) and muscular atrophy (p. 192). The upper limbs and trunk are the most commonly affected. The muscular weakness and wasting generally begins in the small muscles of the hand. Trophic changes in the skin (p. 363), bones, and joints, and painless whitlows (p. 412) are common. Patients frequently burn their fingers owing to the loss of sense of pain. Excessive redness of the skin and sweating are present, and lateral curvature of the spine is common (p. 620). The sphincters are generally unaffected.

Treatment.—The general health is maintained as far as possible.

The patient is not confined to bed. The prevention of burns, sores, etc., is important. The disease is very chronic and incurable. The chief complication is disease of the respiratory system.

Chronic Spiral Muscular Paralysis, or Creeping Paralysis.—A disease due to degeneration of the neurones of the lower segment of the motor path, marked by progressive weakness and wasting of the muscles.

Cause.—The cause is not known, but exposure, anxiety, over-strain, and lead-poisoning are thought to be causes.

Symptoms.—Gradual wasting and feebleness of the muscles, which usually starts in the hands, is the first symptom. The hand becomes deformed (claw hand), the tendon reflexes (p. 363) in connection with the affected muscles disappear, and rheumatic pains may be complained of. In the legs there may be weakness without wasting. The disease is progressive, but may become stationary though at a late stage.

Treatment.—Avoidance of mental and bodily fatigue and undue exposure is important. Massage and electrical treatment are given. Hypodermic injections of strychnine are prescribed, and are given daily over a prolonged period. The patient is not kept in bed. The diet should be generous, any digestible nourishing food is allowed.

The complications include: Bulbar paralysis (p. 373) and respiratory disease (p. 248).

Spastic Paraplegia.—A disease due to primary degeneration of the upper motor neurones.

Causes.—The condition may be due to concussion of the spine, influenza (p. 353), syphilis (p. 322), undue exposure (p. 552), lead poisoning (p. 383), gout (p. 312), and hereditary predisposition. It may be the first evidence of disseminated sclerosis (p. 379), or general paralysis of the insane (p. 406).

Symptoms.—The onset is marked by weakness of the legs which is very gradual. The patient complains of the limbs feeling heavy and tired, and there is some stiffness. The muscles are well nourished. The arms may also suffer from weakness and rigidity. The tendon and cutaneous reflexes (p. 363) are exaggerated.

Treatment.—Complete rest is given for a time. Nerve tonics and drugs to lessen the spasm are prescribed. Turkish or hot-air baths (p. 112) are often beneficial. The disease is very chronic and there is generally no danger to life. Massage may be ordered in some cases. The disease may cease to progress after a time. In rare cases all the muscles of the body become affected and death results from exhaustion.

Locomotor Ataxy, or Tabes Dorsalis.—A condition associated with primary degeneration of the afferent neurones of the posterior nerve roots.

Cause.—Syphilis (p. 322) or undue exposure to heat and cold may be the cause.

Symptoms.—The disease is divided into three stages, viz. the preataxic, the ataxic, and the paralytic. Cases do not often progress beyond the second stage. The early symptoms are pains in the legs sometimes suggestive of rheumatism, but often sharp and momentary (*lightning pains*). Other pains may be present and are more persistent, lasting for days or months. Pain around the waist is known as the *girdle pain*. Sensation may be disturbed in the feet so that the patient feels as if he were standing on a thick carpet instead of the bare floor. Sensation of pain and temperature may be altered, and allochiria (p. 363) may be present. The knee jerks are lost. In well-marked cases, ataxy (p. 361) in standing and walking and loss of muscular tone are present. The tabetic gait is present and is very characteristic: at each step the leg is lifted very high, and brought to the ground forcibly, the body swaying from side to side. Later the bowels and bladder are almost always affected; retention of urine (p. 238) occurs. The pupils may be small, and *Argyll-Robertson pupil* is characteristic (the pupil reacts to accommodation but not to light). *Gastric or visceral crises* are common and are marked by epigastric pain which may be intense and may or may not be accompanied by vomiting.

In advanced cases trophic changes are common and include: Perforating ulcer of the foot (p. 363), spontaneous fracture (p. 526), Charcot's joint disease, club-foot (p. 613), loss of hair (p. 363), nails, and teeth.

Treatment.—Mental and bodily fatigue and all excesses should be avoided. The patient is not kept in bed and should continue with a suitable occupation if possible. Anti-syphilitic treatment (p. 322) is prescribed if necessary. Intravenous injection of Salvarsan (Kharsivan) (p. 84) may be followed by venesection (p. 82) and the following day by lumbar puncture (p. 86), and injection into the spinal canal (*intrathecal injection*) of the serum prepared from the blood obtained by venesection. As soon as the serum is injected into the spine the patient lies flat, without a pillow, with the foot of the bed raised on blocks, for one hour; the room being darkened. A four-hour chart is kept from the time of the Salvarsan injection until the lumbar puncture is performed, the temperature, pulse, and respiration are then taken every two hours, the patient remaining in bed until the temperature is normal. Antipyrine, bromide, or morphia may be necessary if the pain is severe. The treatment is repeated at fortnightly intervals until pathological examination proves negative. In ataxic cases a regular course of exercises is given to re-educate the co-ordination (p. 361) of movement in the limbs.

Hereditary Ataxy, or Friedreich's Ataxy.—A form of ataxic paraplegia (p. 361) which commences at an early age and may occur in several members of a family.

Cause.—An infectious disease may be the exciting cause when a history of epilepsy (p. 385) or insanity is present in the family.

Symptoms.—Weakness and unsteadiness in the legs are the primary symptoms. The ataxy is of the reeling kind, the legs are kept wide apart when walking. The weakness and inco-ordination (p. 361) gradually increase and spread to the upper limbs. The knee jerks (p. 363) are lost. There may be defective articulation, nystagmus (p. 209), pes cavus (p. 622), and curvature of the spine (p. 620).

Treatment.—Exercises are given in the early stages. The disease is progressive and incurable, but it does not often cause death. The patient should lead a healthy life as far as possible and need not be confined to bed.

DISEASES OF THE MEDULLA OBLONGATA

Affections of the medulla or upper part of the spinal cord from which spring the nerves supplying the muscles of the tongue, lips, larynx, and pharynx are included under this heading.

Chronic Bulbar Paralysis.—The cause is not known.

Symptoms.—The primary symptom is defective articulation due to weakness of the tongue. The tongue can be protruded at first but not later; it is either large and soft, or wrinkled and wasted. Later the lips become affected and cannot be brought together, the patient cannot whistle, and pronunciation is altered (p. 364). The saliva can neither be retained nor swallowed, so that it is constantly dribbling away; food collects in the cheeks; weakness of the palate gives the voice a nasal twang; swallowing becomes difficult, and phonation and cough are impaired owing to laryngeal weakness. Sensation and taste are unaffected.

Treatment.—The patient should speak as little as possible and take great care in feeding, as he is very liable to choke. In advanced cases food is administered by oesophageal feeding (p. 54); the patient may be taught to feed himself. He is not confined to bed unless complications occur. Hypodermic injections of strychnine are given in increasing doses over a prolonged period. The disease is incurable. Death may take place from aspiration pneumonia due to food entering the larynx, or exhaustion from starvation.

The complications include pneumonia, suffocation, and exhaustion.

Acute Bulbar Paralysis is due to thrombosis (*p.* 281).

Symptoms.—The onset is sudden. The power of moving the tongue, swallowing, and speaking becomes suddenly impaired. There may also be cough, dyspnoea and weakness of the limbs.

Treatment.—Death usually takes place within a few hours. If the patient survives, partial paralysis remains. The treatment is that given for the chronic form.

Myasthenia Gravis.—A rare disease marked by the presence of cellular and sometimes serous exudation in the tissues, especially in the muscles, liver, and kidneys. It is characterized by extreme fatigue of certain muscles, amounting to a temporary paralysis after these muscles have been in use for a short time.

Cause.—The disease is thought to be due to toxins. It has followed infection, chill, and emotion. The thymus gland may be diseased and as such promote the condition.

Symptoms.—The muscles are feeble and rapidly exhausted by use, but on resting quickly regain what power they possess. Muscular wasting is not present. A faradic current (p. 740) sufficient to cause contractions soon loses its effect, and the muscles cease to respond to it, but after a short period of rest they respond to the same current (myasthenic reaction). The disease includes all the muscles generally, but those of the lips, palate, and pharynx are most commonly affected. Sensation and the sphincters are unaffected.

Treatment.—Symptoms may be relieved by injection, or more slowly by oral administrations of Prostigmin, which produces its maximum effect about one hour after injection, but wears off gradually during the next five hours, so that it is usually given twice a day. The dose is 0·5–2·5 milligrammes hypodermically. Rest and avoidance of chill are essential. Artificial feeding (p. 54) and artificial respiration (p. 549) may be necessary. Massage and electrical treatment are not ordered.

The complications include cardiac failure and respiratory diseases.

DISEASES OF THE BRAIN

Cerebral Meningitis is inflammation of the membranes of the brain. The inflammation may involve the dura mater (*pachymeningitis*), or the soft membranes or pia-arachnoid (*leptomeningitis*). External pachymeningitis is generally due to injury or disease of the skull and is treated surgically (see operations on the brain, p. 477).

Internal Pachymeningitis is most often haemorrhagic.

Causes.—Insanity, alcoholism, and general paralysis of the insane (p. 406) are common causes; it sometimes occurs in connection with acute fevers and haemorrhagic diseases.

Symptoms.—The symptoms may be absent or not distinctive; they include headache, convulsions (p. 588), apoplectiform seizures (p. 377), and hemiplegia (p. 377).

Treatment.—Rest in bed in the recumbent position with the head raised, cold applications to the head (p. 93), and gentle purgation is the treatment prescribed.

Suppurative Leptomeningitis.—*Causes.*—The condition may occur as a complication of pneumonia (p. 251), empyema (p. 264), and mastoid disease (p. 656). It may also complicate or follow the acute fevers, ulcerative endocarditis (p. 269), rheumatism (p. 310), erysipelas (p. 581), or may be due to tuberculous (p. 318) or syphilitic (p. 322) diseases.

Symptoms.—Headache, vomiting, optic neuritis (p. 636), delirium (p. 359), convulsions (p. 588), paralysis (p. 361) of cranial nerves and of the limbs, constipation (p. 186), and disturbance of pulse (p. 200), temperature (p. 195), and respiration (p. 205) are commonly present. Later, unconsciousness occurs with incontinence of faeces and urine. Pyrexia is usual but is irregular in type. The pulse may be either rapid or abnormally slow, and is often out of proportion to the temperature. Cheyne-Stokes respiration (p. 206) or some other abnormal respiration may be present. In the early stage of the disease the pupils are contracted, later they become dilated, and may be unequal; conjugate deviation (p. 209) may supervene, also ptosis (p. 637) and facial paralysis. In children convulsions (p. 588) are common. Tonic spasm (p. 361) of the muscles of the back of the neck causes retraction of the head, other muscle spasms may cause opisthotonos (p. 584) or emprosthotonos (p. 584). The limbs may be rigid or flaccid on both sides. There may be abnormal sensitiveness of the skin and of the senses of hearing and sight, so that light and noise cause intense suffering. During the time the patient is conscious he may utter a scream known as the *cephalic cry*. Very few cases recover.

Treatment.—The cause is treated. Ice-bags (p. 92) or ice poultices (p. 93) or cold Leiter's coil (p. 93) and leeches (p. 103) are applied to the head after shaving it (p. 438). A saline purge is administered. Lumbar puncture (p. 86) may be performed both for diagnostic purposes and for treatment. Sulphanilamide has proved of value. If any particular organism is known to be the cause, vaccine treatment is prescribed. Nourishment will have to be administered by nasal (p. 55) or oesophageal feeding (p. 54).

Tuberculous Leptomeningitis.—*Causes.*—The condition may be

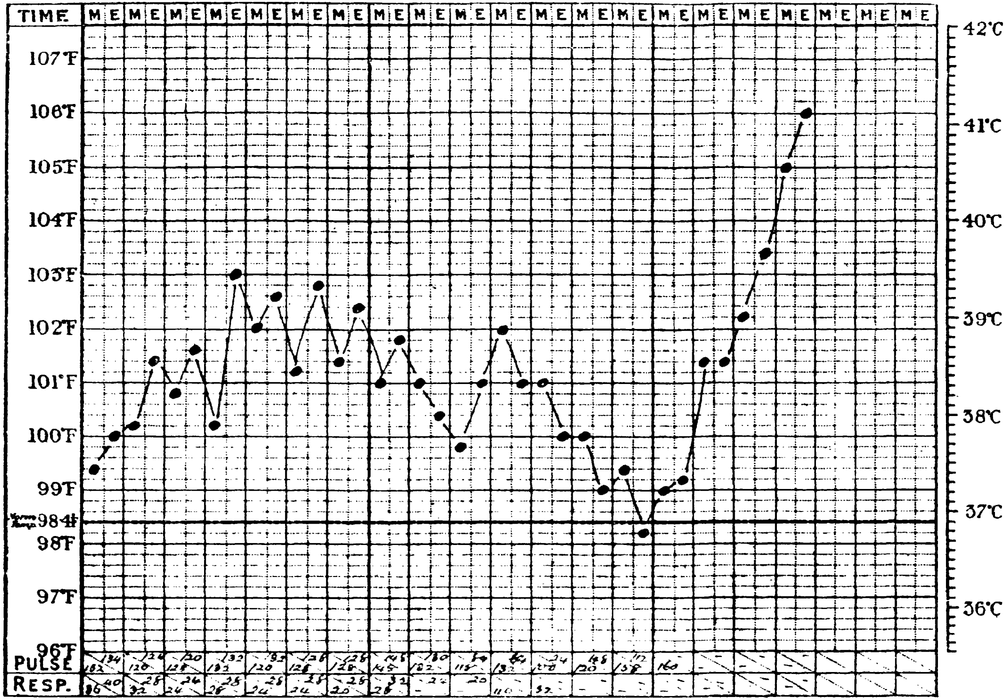

FIG. 181. Temperature chart of a case of tuberculous meningitis occurring in a child of one year old.

secondary to general tuberculosis (p. 318) or to some other tuberculous lesion.

Symptoms.—Headache, loss of flesh, and restlessness are symptoms which precede the onset, which is accompanied by headache, vomiting, pyrexia, and often convulsions (p. 362). The head is retracted and the cephalic cry (p. 375) is present. Later, the stage of compression sets in and gives rise to false hopes; the temperature falls, vomiting ceases, the child sleeps nearly all day but can be roused to take nourishment, the pulse does not improve and is often slow and irregular. This stage is followed by one of coma (p. 360) and paralysis (p. 361); the limbs may be rigid or weakened on one side. The pupils are dilated, and squint (p. 642) may be present. The temperature may be either subnormal or high (104°-107° F.; see chart, Fig. 181), the pulse rapid, and incontinence of faeces and urine occurs. Recovery is rare. The treatment is that described under meningitis in addition to that given under tuberculosis (p. 318).

Hemiplegia, or paralysis of one vertical half of the body.

Cause.—Any condition which damages or compresses the motor path at any part of its course within the cranium may be the cause.

Symptoms.—In a well-marked case there is complete paralysis (p. 361) of the arm, leg, lower part of the face, occurring on the side opposite the lesion, and the muscles of the upper part of the face and the trunk may be weakened. Muscular rigidity is often present. The paralysed limbs may be colder or warmer than the others, they may also be red or livid, slightly swollen, and perspiration may be more profuse. In severe cases bedsores (p. 17) and trophic changes (p. 363) occur; these cases seldom recover. If the patient survives, partial recovery may take place or the muscles may remain permanently paralysed. In children the growth of the limb is interfered with.

Treatment.—The cause is treated. The patient is kept quiet and in the recumbent position. When the cerebral lesion has healed, massage and electrical treatment are prescribed for the paralysed muscles. A change of air and tonics are ordered during convalescence, which may extend over months. (See also treatment of cerebral haemorrhage, below.)

Intracerebral Haemorrhage, or Apoplexy.—*Causes.*—The disease occurs commonly after the age of forty. Arterial degeneration (p. 277), physical and mental excitement, haemorrhagic diseases, chronic alcoholism, and syphilis (p. 322) may be causes.

Symptoms.—The patient may lose consciousness at once and fall, or he may feel giddy and become weak on one side, the speech then becomes indistinct and unconsciousness supervenes. In a few cases consciousness may not be lost, in others a comatose condition is present. Respiration is slow, laboured, and stertorous (p. 205), the cheeks are puffed out with each expiration. The limbs on the opposite side of the lesion become paralysed, the head and eyes may be turned to the side of the cerebral lesion (see conjugate deviation, p. 209), incontinence of faeces and urine is present. In cases where the effusion continues to increase, the coma deepens and death supervenes, the temperature remaining subnormal. In the majority of cases signs of returning consciousness will be observed in the course of a few hours. The speech may be altered; indistinct, or incomprehensible (p. 364). When the patient survives two or three days, inflammatory changes take place around the lesion and the temperature rises, the pulse is accelerated and delirium may be present. Serious trophic changes of the skin may occur, especially a rapid-forming bedsore (acute decubitus, p. 363) on the buttock of the paralysed side. In milder cases the symptoms are less well marked and gradual recovery takes place except for the local symptoms. The leg more often recovers than the arm, in many cases the hand remains permanently powerless and becomes rigid.

Treatment.—The patient is kept in bed in the recumbent position with the head raised. Absolute quiet is necessary, and he should be moved as little as possible until the acute symptoms have subsided. A purge, either calomel or croton oil, is prescribed. An ice-bag may be applied to the head and hot bottles to the feet. If retention of urine is present, catheterization (p. 66) must be regularly performed. Liquid diet is given as soon as the patient recovers consciousness, later, when the acute stage is over, light solid diet is allowed. Rectal feeding (p. 58) may be necessary until consciousness returns. Stimulants are not given and the diet should be of an unstimulating nature. In uncomplicated cases the patient is kept at rest for six weeks, after which he is allowed up. Massage (p. 745) and electrical treatment are given to the paralysed limbs as soon as the acute symptoms subside. The limbs must be maintained in correct position from the first in order to prevent subsequent deformity. The unfavourable symptoms include: Cheyne-Stokes respiration (p. 206), dyspnoea (p. 205), hyperpyrexia (p. 195), acute decubitus (p. 363), return of drowsiness, delirium, and vomiting.

The complications are: Pneumonia (p. 251), embolism (p. 282), infarction (p. 282), recurrent haemorrhage, kidney disease (p. 241), and oedema of the lungs (p. 260).

Thrombosis or embolism (p. 282) of the cerebral arteries.—The symptoms are much the same as those described under cerebral haemorrhage. The nursing treatment is the same, with the exception that strong aperients are not given and the patient's strength is maintained as far as possible.

Disseminated Sclerosis.—The condition may be due to cerebral or cerebrospinal disease, the latter being the most common.

Cause.—The cause is unknown. It may follow an acute infection, syphilis (p. 322), injury, or exposure, but often no cause is apparent.

Symptoms.—Muscular weakness of varying distribution, often partial and of sudden origin, is an early symptom. Coarse jerky tremor may be present on attempting to use a limb (see intention tremor, p. 361). Sensation may be impaired, but is often normal. There may be impaired vision, nystagmus (p. 209), and a squint (p. 637). Mental change may be present but is slight, and consists in abnormal contentment in spite of increasing disability. There may be attacks of headache, vomiting, and vertigo.

Treatment.—Arsenic is prescribed and anti-syphilitic treatment if necessary. The general health is maintained as far as possible. In the early stages the patient is not kept in bed. Considerable temporary improvement may take place, but the disease progresses by fits and starts and eventually the patient becomes bedridden. Latterly treatment by hyperthermia (p. 113) has given good results.

Encephalitis, or Inflammation of the Brain.—*Cause.*—Concussion (p. 545), injury, acute infectious diseases, or alcoholism may be the cause.

Symptoms.—The chief symptoms are headache, vomiting, delirium, convulsions (p. 362), and pyrexia. There may be weakness in the limbs on the side opposite to that of the lesion. The symptoms may resemble those of meningitis (p. 374). The treatment is that described under meningitis. Recovery may take place when the lesion is slight, but not otherwise.

Suppurative Encephalitis, or Cerebral Abscess.—*Causes.*—Chronic or acute suppurative otitis media (p. 656), injury, and disease of the skull are common causes.

Symptoms.—The abscess may be acute or chronic. In acute cases the symptoms resemble those of meningitis (p. 374). In chronic abscess they may be slight and unnoticed. Headache may alternate with discharge from the ear, later drowsiness, severe headache limited to one side, vomiting, a slow pulse, constipation, and optic neuritis supervene. The temperature is usually subnormal but there may be rigors (p. 207) and pyrexia (p. 195), followed by profuse sweating and a fall of temperature. There may be nystagmus (p. 209), deviation of both eyes away from the side of the lesion (see conjugate deviation, p. 209), retraction of the head may be inclined towards the side of the lesion. Surgical treatment is given (p. 477).

Hydrocephalus, or Dropsy, or Water on the Brain.—The condition may be congenital, or be due to meningitis or a tumour.

Symptoms.—Gradual enlargement of the head is the prominent symptom. The intellect is sluggish, with a poor memory, and a tendency to sleep by day, or the mental condition may be one of complete idiocy.

Treatment.—Repeated lumbar puncture (p. 86), and sometimes surgical treatment is given. An elastic band may be applied to the head for several periods of a week each. Mercurial inunction (p. 97) of the shaven scalp is sometimes prescribed. Bromide is given for convulsions if they occur. In tuberculous cases treatment is given for tuberculosis (p. 318).

Tumour of the Brain.—Tumours affecting the brain may be tuberculous, gliomatous, sarcomatous (p. 314), or syphilitic (p. 322).

Symptoms.—The general symptoms include headache, vomiting, giddiness, optic neuritis (p. 636), convulsions (p. 362), loss of flesh, polyuria (p. 243), disorders of speech (p. 364), and mental disturbance. The local symptoms vary with the position of the tumour.

Treatment.—Anti-syphilitic treatment (p. 322) is given in syphilitic cases. In others the tumour is treated surgically, either by removal (p. 477) if possible, or a decompression (p. 477) operation may be performed. Recovery is rare except in cases of syphilitic origin.

Aneurysm of the Cerebral Arteries.—The symptoms may be absent. They consist of pulsating headache, giddiness, and paralysis (p. 361) of the cranial nerves or of the limbs.

Treatment.—The patient should lead a quiet life and avoid exertion or strain. Rupture of the aneurysm usually occurs and ends fatally.

Vasomotor and Trophic Diseases

Erythromelalgia, or Red Neuralgia.—This is a rare condition, characterized by intense burning pain, a bright red colour, and local elevation of temperature in the peripheral part of one or more limbs. Some cases recover, whilst others remain unchanged or gradually become worse.

Cause.—The condition may occur independently, or in connection with structural disease of the nerves or spinal cord; it is induced or much aggravated by allowing the limb to hang down, or by exposure to heat.

Treatment.—Prolonged rest with elevation of the part is essential.

Local applications of cooling and anodyne preparations may do good, and aspirin sometimes relieves the pain.

Raynaud's Disease.—A disease characterized by local syncope, local asphyxia, or cyanosis (p. 188), and symmetrical gangrene (p. 573), but one or two of these conditions may be absent.

Causes.—The disease may follow any of the following conditions: Exposure to cold, tuberculosis (p. 318), disease of the heart and blood-vessels, peripheral neuritis (p. 365), scleroderma, or toxaemia (p. 577).

Symptoms.—Local syncope is seen in ' dead fingers '; the affected part is white and cold, there is numbness, and sensation is impaired. Local cyanosis or asphyxia follows and the part becomes either blue or black; if this condition persists for many hours or days some of the tissues, especially the skin, undergo necrosis or gangrene. In these cases pain is very severe. The parts most commonly affected are the extremities of the limbs, the tip of the nose, and the margins of the ears. After one or more paroxysms of local cyanosis either with or without gangrene, the disease may subside partially or completely.

Treatment.—Cold and undue exposure must be avoided. Hot water should be used for washing. Exercise is necessary in order to assist the circulation, and massage (p. 745) and treatment by hot baths (p. 116), light baths (p. 737), electric baths (p. 743), and hyperthermia are of great value. The clothing should be warm and light and must not in any way restrict the circulation; for instance, garters, rings, etc., or anything tight should not be worn. The diet should be nourishing and stimulating, and is not restricted. The drugs which are commonly prescribed include opium, if the pain is very severe, nitroglycerine, and quinine. The affected part is covered in cotton wool and a loose bandage or binder. Gangrenous fingers and toes may require amputation (p. 475), but this is not undertaken at once, as in many cases the apparently dead parts recover to a remarkable extent.

Osteitis Deformans.—A rare disease marked by changes in the long bones and cranium. The long bones become enlarged and softened so that the legs are curved. The clavicles become prominent, kyphosis (p. 620) develops, the cranium is enlarged, but the face remains unaltered. No successful treatment is known. The disease is very chronic.

Chronic Alcoholism.—A condition which occurs as a result of prolonged over-indulgence in alcohol.

Symptoms.—The symptoms include digestive, renal, and nervous manifestations. The digestive symptoms are chronic gastric catarrh (p. 218), with anorexia (p. 210), morning sickness, furred tongue, and irregularity of the bowels. Cirrhosis of the liver (p. 233) may result and cause haematemesis (p. 217), melaena (p. 564), haemorrhoids (p. 279), distension of the small blood-vessels on the face, ascites (p. 191), and yellow conjunctivae. Renal symptoms which may develop are those given under disease of the kidney (p. 241). The nervous system is the most seriously affected, the early symptoms in acute alcoholic intoxication being inco-ordination (p. 361), excitement, talkativeness, and later stupor. In the chronic condition there is muscular tremor (p. 361) involving the tongue, lips, and hands; deterioration of morals, and a failing memory. The patient sleeps badly, is troubled with bad dreams, is restless, irritable, and becomes unreliable. Hallucinations (p. 360) of hearing, delusions (p. 405), suspicions, and actual assaults ending in murder or suicide may occur. Chronic dementia (p. 405) may supervene.

The complications include: Multiple neuritis (p. 365), myelitis (p. 369), meningitis (p. 374), epilepsy (p. 385), and delirium tremens (p. 359).

Treatment.—Abstinence from alcohol is essential, a tonic is substituted to start with. Hypodermic injections (p. 84) of strychnine and atropine may be prescribed, and are given in increasing doses over several weeks until the maximum dose is reached; the drug is then gradually decreased until it is discontinued. Paraldehyde is given for insomnia (p. 358). The diet is not restricted and should consist of food that the patient enjoys and can take; sweet and highly seasoned dishes may help to diminish the craving for alcohol. The patient should be removed to some suitable institution or nursing home whilst undergoing the cure, as strict supervision is necessary. He should be encouraged to take exercise and to occupy himself with an outdoor occupation. Massage is beneficial.

The Drug Habit.—Dipsomania.—This condition is frequently acquired by the use of morphia during an illness, the patient having been allowed to take the drug over a prolonged period gets to rely on it and is unable to give it up. Other drugs such as cocaine, ether, etc. may produce the drug habit in the same way.

Symptoms.—The skin is pale and sallow, there is premature greyness, and the patient appears prematurely aged. The body is emaciated, the eyes sunken, and the expression dreamy. Shortly after taking a dose of the drug there may be transient increased mental activity followed by loss of memory and moral deterioration; the patient becoming untruthful, sly, cunning, and deceitful. Sudden withdrawal of the drug causes restlessness, insomnia, diarrhoea, and great suffering.

Treatment.—The patient must be treated in a suitable institution. The drug is withdrawn very gradually by decreasing the quantity each day until a very small dose is given; the drug may then be administered by rectum for a short time and finally discontinued. The hyoscine treatment has, in some cases, effected a permanent cure. Other drugs may be prescribed for the insomnia to start with, but are not continued for any length of time. Hot baths given at night are of value if the patient is restless or has the fidgets, and massage (p. 745) is most useful. Nourishing food, moderate exercise, and some occupation are helpful. The nurse must never trust the patient, as all manner of deceptive methods may be used to obtain the drug; on the other hand the patient must not know that he is watched and suspected. On no account must he be allowed to know what drugs the physician prescribes for him, otherwise he may acquire another drug habit when he is no longer under supervision. Alcohol is forbidden during the cure and the patient should be warned against taking it at any time. Any cause for which the drug was taken is removed if possible. Change of air and surroundings is often beneficial in assisting the cure.

Plumbism, Saturnism, or Lead Poisoning.—*Causes.*—Lead may enter the system by the alimentary tract, the skin, or the respiratory tract. It is sometimes taken by women to produce abortion (p. 705). Workers in lead, such as painters, compositors, and lead smelters, are often affected.

Symptoms.—*Lead colic*, or painter's colic, is marked by severe abdominal pain, constipation, and a slow pulse of high tension, (p. 202). The pain is paroxysmal and cramp-like. Saturnine cachexia is marked by anaemia (p. 283) and an earthy tinge of the skin. There is a bad taste in the mouth, the breath is offensive, and a dark-blue line is seen at the margin of the gums except where teeth are absent. There may be pain in the limbs, joints, muscles, and nerves, with tingling and impaired sensation (p. 363) and tenderness of the muscles. Lead palsy is a common symptom; it may occur without sensory disturbance, but there may be pain in the limbs. Symmetrical wrist drop is a characteristic symptom, and in a few cases the muscles of the upper arm, the hands, and the legs may be affected. Wasting of the muscles occurs and the reaction of degeneration (p. 740) is present and is attributed to degenerative neuritis (p. 361) of the motor fibres. It may recover completely with appropriate treatment. Chronic lead palsy resembles progressive muscular atrophy (p. 192) and recovery is rare. Saturnine encephalopathy is another form of lead poisoning and is characterized by convulsions (p. 362), delirium (p. 359), and coma (p. 360) of acute onset. Melancholia (p. 403) and other mental symptoms may be present; optic neuritis (p. 636) may cause permanent blindness, or the patient may die. Kidney disease is common (for which see p. 241). Menorrhagia (p. 684) and miscarriages (p. 705) occur in women.

Treatment.—The various symptoms are treated as they arise. The patient must discontinue work if that is the cause, other causes are removed if possible. In the *prevention* of industrial lead poisoning a diet of high calcium content (p. 798) is important. Morphia may be necessary for pain in colic. In convulsions, nitrite of amyl inhalations are prescribed. Paralysis is treated by massage (p. 745) and electrical treatment, and later by hypodermic injections of strychnine.

Dietetic treatment.—Storage of lead.—In cases of industrial lead poisoning showing toxic symptoms, a high calcium diet (p. 798) is given to promote the storage of lead. A high calcium diet will afford relief after forty-eight hours to the pain of lead colic, most of the lead is fixed in the bones and the patient presents no symptoms. A suitable diet would include 3 pints of milk daily, milk puddings, cheese, eggs, green vegetables. Calcium lactate, 30 grammes three times a day, is given in milk before meals.

Elimination of lead.—After the acute symptoms have subsided, the elimination of lead from the body is encouraged by a *low* calcium diet which removes the lead stored in the bones. The diet includes meat, fish; no milk, eggs, or food rich in calcium are given (p. 798). Calcium lactate is not given. Ammonium chloride 1 gramme is given in water six to ten times daily. Loss of appetite and headache signifies the limit of tolerance to the treatment and the dose should then be reduced. After four weeks of treatment a rest period of one week is given, when a normal diet with plenty of milk to counteract the calcium deficiency is given. Treatment to stimulate the elimination of lead and to regulate the bowels is continued for a long time, for the dispersal of lead does not always indicate the disease is cured.

Chronic Mercurial Poisoning occurs in those who work in quick - silver mines and in others who breathe mercurial vapour.

Symptoms.—Slight stomatitis (p. 214), gastric disturbance, diarrhoea, anaemia (p. 283), and sometimes salivation are common symptoms. A blue line on the gums may be present. The most marked symptom is a tremor known as mercurial tremor, or metallic tremor. At first it occurs only on movement (see intention tremor, p. 361), but later it may become continuous and is always increased by emotion. It commences in the face and tongue, and later extends to the upper limbs and may affect the lower limbs. It interferes with speaking, walking, and the patient may be unable to feed himself. There may be sensory and mental symptoms.

Treatment.—Recovery usually takes place after withdrawal of the cause. In the later stages, iodide of potassium is prescribed to assist in eliminating the poison.

Chronic Arsenical Poisoning occurs in persons working with arsenic, such as paper-hangers, milliners, makers of artificial flowers, etc. Some bright green or brown wall-papers contain arsenic, and persons living in rooms papered with these papers may be affected. It has been produced in beer drinkers owing to the employment of impure chemicals in the manufacture of this beverage.

Symptoms.—The symptoms include anorexia (p. 210), irregularity of the bowels, puffiness of the eyelids, conjunctivitis (p. 631), herpes zoster (p. 416), multiple neuritis (p. 365), and pigmentation of the skin. Palsy of the limbs occurs as in lead poisoning, only with more marked sensory symptoms, i.e. pain, anaesthesia (p. 363), etc., as in alcoholic neuritis (p. 365) and ataxy (p. 361) with defective sensibility. Arsenical neuritis occurs in the legs earlier than in the arms. Pigmentation of the skin may be most marked on the trunk, but also occurs on the neck and limbs.

Treatment.—The cause is removed if possible, and the various symptoms are treated as they arise.

NUTRITIONAL AND FUNCTIONAL DISEASES OF THE NERVOUS SYSTEM

Epilepsy.—A chronic disease characterized by recurring attacks of convulsions (p. 362) or unconsciousness (p. 544) or both.

Idiopathic epilepsy is the condition in which the attacks cannot be accounted for by brain disease, morbid blood states, or reflex irritation. *Jacksonian epilepsy* is commonly due to organic disease or injury of the brain, the convulsions involve only a few muscles, or constantly begin in a certain group of muscles. *Organic epilepsy* results from a focal lesion in the brain. *Petit mal*, or *minor epilepsy*, is characterized by loss of consciousness without convulsions. *Major epilepsy*, or *haut mal*, is a condition in which general convulsions form a part of the seizure.

The *causes* may be injury, fright, anxiety; or insanity in the family may be a predisposing cause; often no cause can be found.

The symptoms of major epilepsy.—The patient has recurring seizures in which he suddenly falls to the ground unconscious, and is convulsed (p. 362). Consciousness (p. 544) is lost suddenly and completely so that the patient often hurts himself by falling against some hard object, or he may fall into water or the fire and be either drowned or burned. At the commencement of the attack there is often a cry; it may be a loud roar, a scream, a moan or a groan, and is known as the *epileptic cry*. The muscular spasm is at first tonic (p. 361), so that the body is rigid, the legs are extended, there may be deviation of the head and eyes to one side. The face is at first pale, then flushed, later cyanosed. The tonic spasm is soon replaced by clonic spasm (p. 361), the jerkings being slight at first, then coarse and violent. The tongue may be bitten, there is frothing at the mouth. The jerkings gradually become less frequent, then cease, the patient remaining for some time in a state of coma (p. 360) which is followed by natural sleep. Incontinence of urine almost always occurs, and there may also be incontinence of faeces. During the attack the pupils are dilated. The convulsion lasts about two or three minutes, the patient becomes conscious shortly after, and may sleep for several hours, or may perform automatic movements, i.e. *automatism*. Frequently the patient is not aware of having had a fit.

Petit mal. — In this condition consciousness may not be completely lost, and there are no convulsions (p. 362). The attack may consist of a brief giddiness or unconsciousness, nothing more. The patient stops talking, eating, or walking, looks dazed and pale, and may drop anything he is holding; after a second or two he resumes what he was doing before the attack. The tongue is not bitten, and there may be incontinence of urine.

An *aura* or warning may occur before either kind of attack. It varies in different patients, and may be a flash of light, sparks, or a special noise, a smell, giddiness, or a peculiar sensation in the epigastrium or elsewhere. In some cases the aura gives the patient time to avoid falling in a dangerous spot.

Post-epileptic phenomena may be entirely absent, or there may be headache and vomiting. Aching of the muscles is common, and there may be some feebleness for a short time. Hysterical symptoms may follow an attack. Automatism, also post-epileptic mania may occur, and is often a source of danger to the patient or to others (p. 407). After the fit the patient may turn on his face, which is also a source of danger. There may be mental or moral deterioration between the fits.

In rare cases the *status epilepticus* supervenes. In this form the attacks follow one another so closely that there is no interval between; the condition may continue for a day or two, there is hyperpyrexia (p. 195), and the patient dies without regaining consciousness.

The frequency of epileptic fits varies greatly, a common interval is three or four weeks. They may occur only during sleep, or only when awake, or in some cases during both times.

Treatment.—The patient should lead a quiet, regular life and have a suitable occupation, with sufficient bodily exercise. Over-eating and constipation are to be avoided. The diet should be plain and nourishing. The quantity of meat is much reduced, and salt is excluded from the dietary by many physicians (see also purin-free diet, p. 793). A ketogenic diet (p. 797) is successful in keeping some patients free from fits. Alcohol is not allowed. The chief drugs prescribed are luminal and bromide, given every day continuously until two years have elapsed since the last attack. The status epilepticus may be induced by suddenly discontinuing the drug. Lumbar puncture (p. 86) may be performed as part of the treatment. In Jacksonian epilepsy surgical treatment is frequently successful.

The treatment of fits or epileptiform convulsions.—Place the patient flat on the floor or bed, lying on his back with the *head turned to one side.* Loosen all the clothing, place a spatula, cork, or pencil wrapped in a handkerchief, between his teeth so that his tongue does not get bitten, remove anything in the vicinity on which he might injure himself, and use only such restraint as may be necessary in order to prevent him injuring himself. When the fit is over allow the patient to sleep. A fit may sometimes be arrested by the inhalation of nitrite of amyl (p. 106) when the aura appears; or if the aura appears in a limb, etc., tying a ligature around the limb higher up is sometimes successful in stopping the fit. *Points which should be noted during a convulsion* of any type are as follows: 1. The onset, presence or absence of aura; whether the onset is gradual or sudden; the limb or muscles first affected; the order of the 'spread,' and whether regional—confined to a limb or parts of the body only—or general. 2. Whether consciousness is lost or retained. 3. The colour of the face, whether pale, flushed, cyanosed, or all three. 4. The spasm, whether tonic (p. 361), clonic (p. 361), or both, and the duration of each type. 5. Whether the tongue, lips, or hands are bitten, and whether frothing of the mouth occurs or not. 6. Micturition, whether incontinence of urine occurs or not. 7. Defaecation, whether incontinence of faeces occurs. 8. Whether the patient is silent, talks, or is noisy. 9. The pupils, whether the pupils are dilated, contracted, or unequal, and whether they react to light or not. 10. Coma, presence or absence of coma after the spasm and its duration. 11. Whether any loss of power occurs in any limb after the fit and its duration. 12. The restraint necessary. 13. The termination, whether spontaneous or gradual. 14. The after-symptoms that occur, the duration of coma, sleep, etc., whether automatism follows.

It may not be possible to note all these points during one fit, but those observed should be noted on paper, and when a second fit occurs the nurse should endeavour to record the points missed during the previous attack.

The treatment of the status epilepticus.—The patient requires a special nurse, as it is impossible to leave him for a moment. Lumbar puncture (p. 86) is performed, inhalations of chloroform (p. 447) or nitrite of amyl (p. 106) may be given, and chloral and bromide may be administered by the rectum (p. 60). Hypodermic injections of hyoscine or morphia may be prescribed. Hyperpyrexia (p. 195) is treated by cold or ice packs (p. 110). Nourishment is administered by rectum (p. 60).

Automatism.—The performance of acts without apparent volition, as seen in certain somnambulists, and in some epileptic and hysterical patients. During this time the patient is not responsible for his actions, and as he may commit violent injuries to others he needs constant supervision until he returns to his normal state. (See also epileptic insanity, p. 407.)

Neuralgia.—Neuralgia is the term applied to pain in a nerve which is not accounted for by structural disease in the nerve or nerve-centre; the term is also used to indicate pain at a distance from its cause, pain due to neuritis (p. 365), and pain which persists after the removal of its cause.

Causes.—Debility, irritation of nerve, neuritis, exposure, morbid blood states, such as lead poisoning (p. 383), etc., are the most common causes.

Symptoms.—The chief symptom is pain which occurs in paroxysms and may be present in the interval. It may be continuous, aching, or boring, and be momentary, stabbing, darting, and intense in character. It may be relieved by firm pressure, and is influenced by temperature. There may be tender points in the course of the affected nerve, twitching of the muscles, and trophic changes (p. 363) such as loss or greyness of hair, vasomotor disturbance (either pallor or flushing of the skin), sweating, throbbing of the blood-vessels, or oedema (p. 190).

Treatment.—The cause is treated and removed if possible. The general health is attended to, and abundance of nourishing food should be given. Local treatment consists in the application of anodyne, and irritant liniments (p. 95); the actual cautery (by electricity); nerve stretching (p. 471); or injection of alcohol or sterilized saline solution into the sheath of the nerve. In very severe cases such as trigeminal neuralgia, the ganglion or a part of it may be removed by operation (see Gasserian ganglion, p. 471).

Migraine.—A paroxysmal affection characterized by headache, usually unilateral, and by gastric, vasomotor, and visual disturbances.

Causes.—Overwork, insomnia (p. 358), excitement, toxaemia (p. 577), the 'allergic state' (p. 304), and astigmatism (p. 642) are frequent causes.

Symptoms.—Severe headache, which may be unilateral, is the prominent symptom. The eyeballs ache and are tender. Light, noise, movement such as sitting up, stooping, etc., all aggravate the pain. There is loss of appetite with nausea, and as the headache gets to its worst, vomiting frequently occurs. The face may be pale all through the attack, or it may be pale at first and become flushed as the headache increases. After continuing for several hours, or in severe cases several days, the pain subsides, and the patient falls asleep and subsequently is free from pain though listless and worn out.

Treatment.—During the attack complete rest in a darkened room is necessary. Treatment of the 'allergic state' (p. 304) may cause all symptoms to disappear. Attention to the diet is necessary. In view of the tendency to ketosis (p. 289) in these patients, the fat intake should be reduced. Clinical evidence points to carbohydrates being responsible for symptoms in many cases. The intake therefore of both carbohydrates and fats should be diminished, making up the deficiency by the administration of dextrose. Luminal is prescribed, according to the tolerance of the patient, in doses of half to two grains three times a day. Other drugs used are antipyrin, salicylates, and acetanilide. The bowels need careful regulation: a mercurial purge is commonly prescribed at the outset, followed by saline aperients. A mustard plaster (p. 94), ice-bag, or ice poultice (p. 93) applied to the nape of neck sometimes relieves the pain, or hot mustard foot-bath or hot bottles to the feet may be of use.

Chorea, or St. Vitus's Dance.—The term applied to a disease characterized by involuntary muscular twitchings. It occurs commonly between the ages of five and fifteen, and girls are more prone to suffer than boys. A healthy child may contract the disease from watching the movements of an affected one.

Causes.—Fright, rheumatism (p. 309), and hereditary predisposition are common causes.

Symptoms.—The symptoms consist in spontaneous movements of the muscles which are irregular in time and degree. The movements involve the face, trunk, tongue, and limbs, are increased by voluntary movement and excitement, and cease during sleep, but may be so violent as to prevent sleep. In severe cases the patient may be thrown out of bed, or may be seriously hurt from knocking the limbs on the bedstead whilst in bed. The arms are usually more affected than the legs; the patient is unable to hold things in his hands, and in many cases cannot get food to the mouth. The affected muscles are weak, and in a few cases rigid. Speech is often impaired, and mental disorders may be present and include irritability, disobedience, and maniacal excitement. Incontinence of urine and faeces may occur in the mental cases. The heart may be affected and the pulse rapid.

The complications include: Endocarditis (p. 269), pericarditis (p. 274), pleurisy (p. 262), erythema (p. 188), and tonsillitis (p. 669).

Treatment.—Mental and physical rest is essential. In the acute stage the patient should be isolated, and books, letters, toys, etc., are forbidden. In slight cases a daily warm bath may be given. In severe cases the patient must be prevented from possible injury; if a child, the side of the cot should be padded with pillows, and in very acute cases it may be necessary to nurse the patient on a mattress laid on the floor. The drugs prescribed include arsenic, chloretone, salicylate of soda, and drugs to induce sleep. The patient should not be allowed to do anything for himself until the acute stage is over. The administration of food is often attended with difficulty, and the patient may experience great difficulty in mastication and swallowing. Nasal feeding (p. 55) is resorted to in severe cases. The child should be encouraged to sleep as much as possible; some physicians keep the patient constantly asleep or in a drowsy condition until the acute stage is past. As the condition improves, toys, books, or some light occupation is allowed for a part of the day. Massage is given in the later stages. During convalescence a change of air, tonics, and abundance of nourishing food are required. Children should not be allowed to resume lessons for some months after all the symptoms have subsided.

Huntingdon's Chorea occurs between the ages of thirty and forty. The face and the upper limbs are the first affected. The gait is unsteady later, and eventually all the muscles become affected. The movements resemble those of chorea but are slower. General mental impairment supervenes and terminates in dementia (p. 405). The disease is incurable, but may last over several years.

Habit Spasm.—This term is applied to habitual movements which the patient can control for a limited period, but which recur as soon as his attention is withdrawn. The condition occurs most commonly in children and young adults. The movements may include shaking or nodding the head, winking, making faces, sniffing, biting the nails, shrugging the shoulders, etc.

Treatment.—The general health should be attended to and the patient educated to withstand the habit. Massage and exercises may do good.

Occupation Neuroses.—**Writer's Cramp** is a condition due to a bad mode of writing, or excessive writing, which produces inco-ordination (p. 361) of the muscles used for writing. Other occupation neuroses occur in telegraphists, typists, piano players, milkmaids, cigarette rollers, etc., but writer's cramp is the most common.

Symptoms.—The onset is gradual. The patient first notices that he cannot write with the same ease, and there is aching of the hand which becomes very tired after the day's work. The writing becomes shaky, and later illegible. There is no anaesthesia (p. 363), but there may be tingling, tremor (p. 361), pain, and weakness. Later, other acts necessitating movement of the fingers may be impaired.

Treatment.—The affected part should have complete rest. Strychnine and nerve tonics may be prescribed. Massage is ordered but is not given over the tender nerves (p. 745). The tender area is often treated with blisters (p. 95). Nourishing food in abundance and regular healthy exercise are necessary. The patient should learn to write with the other hand.

Torticollis, or Wry Neck, is an abnormal contraction of one of the muscles of the neck which causes the head to be drawn to one side.

Causes.—The condition may be congenital, or be due to emotion, exposure, injury, or habit.

Symptoms.—The onset is gradual. The spasm may be tonic (p. 361), clonic (p. 361), or both; it ceases during sleep and varies in severity from time to time. The position of the head varies according to the muscles affected.

Treatment.—In the congenital form, tenotomy (p. 466) may be performed. When due to other causes, massage (p. 745) and exercises form an important part of the treatment. Bromide and valerian may be prescribed. In cases which do not respond to treatment neurectomy (p. 471) may be undertaken.

Paralysis Agitans (Parkinson's Disease), or Shaking Palsy, is a disease which occurs in later life.

Cause.—Often no cause can be found. Exposure, shock, injury, and acute disease may be causes.

Symptoms.—Tremor (p. 361) is the first symptom. It starts in the hand, spreads to the remainder of the arm, then to the leg on the same side, and finally to the opposite arm and leg. It is most commonly confined to the limbs, but may be present in the muscles of the back and neck. Weakness and rigidity follow and voluntary movements are slow and feeble. The gait is altered, there may be difficulty in rising, and when the patient starts to walk he takes short, quick steps as if running. The head and neck are thrown forwards; the elbows, hips, and knees are flexed. The face is expressionless, 'wooden'; movement of the lips slow; eyebrows elevated.

Treatment.—No cure is known. Avoidance of mental and physical fatigue; nourishing food, tonics, and fresh air are essential. Massage may be beneficial.

Periodic Paralysis.—The disease is characterized by intermittent paralysis (p. 361). Often more than one member of the family is attacked.

Cause.—It is thought to be due to auto-intoxication. It may follow malaria (p. 326).

Symptoms.—The attack starts without obvious cause in an apparently healthy individual, and occurs most commonly during sleep. The legs are the first to suffer, the paralysis spreading to the arms and trunk, and usually attaining its maximum in 24 hours from the onset. The sphincters, sensation, and the mental faculties are not affected. The paralysis (p. 361) is flaccid, and when at its worst, reaction to faradism and galvanism (p. 740) is lost. After some hours the paralysis passes off, the legs being the last to regain their power. Within a day or two the patient appears quite well. The interval between the attacks varies; they may occur daily, every few weeks, or once a year.

Treatment.—Quinine is prescribed. The bowels must be kept freely open and free diuresis is aimed at. Recovery often occurs after middle life.

Hysteria.—A nervous disorder occurring most commonly in adults. The patient is not merely a hypochondriac who fancies she is ill when she is not; or a malingerer who is pretending. Hysteria is a real disease and must be regarded as a functional disorder of the nervous system (p. 357), even though the patient does try to deceive and imitate symptoms, for instance, the thermometer may be rubbed up to simulate fever, or vomiting may be induced by putting the fingers or a spoon down the throat.

Causes.—Emotion, debility, shock, and imitation or moral contagion may be causes.

Symptoms.—The symptoms are very numerous and varied, almost any disease may be simulated. The mental symptoms include: emotion, loss of will power, judgment, and self-control; loss of power of concentration, irritability, self-consciousness, and oversensitiveness. The moral nature may be depraved, the patient practising deception in order to induce sympathy. Hallucinations (p. 360) may be present, and the patient may become insane, either maniacal (p. 404), melancholic (p. 403), or demented (p. 405). *Trance* or lethargy (p. 403) may supervene, but this condition is not confined to hysteria. It may follow an hysterical fit and sets in suddenly, is marked by pallor, relaxation of the muscles, loss of reflex action (p. 363), and complete unconsciousness. The cardiac action becomes feeble, the pulse may not be perceptible at the wrist. The condition may last for days, weeks, or months, ends gradually or suddenly, and may recur. *Catalepsy* is a variety of trance in which there is plastic rigidity of the limbs. The muscles are at first rigid, but relax later, in the latter stage the limbs may be put in any position, which they maintain until gradually yielding to gravity. The condition is always associated with hysteria, or induced by a recognized cause of hysteria.

Motor symptoms include tonic and clonic spasms, paralysis (p. 361), and convulsions. The spasm may be very persistent, in many cases lasting months or years. Local spasm in the abdominal muscles produces a condition known as *phantom tumour*, which disappears when the patient is under an anaesthetic. Paralysis may be of one limb (monoplegia), or both legs (paraplegia), or one vertical half of the body (hemiplegia). Loss of voice (aphonia) is common, as are mutism and stuttering. The *globus hystericus* is a frequent symptom; the patient feels as if a lump travelled up the gullet to the throat, giving a sensation of choking. There may be absolute loss of appetite, constipation, restlessness, and emaciation. Retention of urine (p. 238) often occurs. Sensory disturbances are common (p. 363). The *convulsions* are usually caused by emotional disturbances. The fit is preceded by laughing or crying, the *globus hystericus*, headache, or other symptoms. The onset is more gradual than in epilepsy (p. 385); the patient falls, but in such a manner that she is not hurt. The attack may be accompanied with a choking cry or scream; the limbs and trunk may be rigid, opisthotonos (p. 584) may be present, or there may be wild, irregular movements of the limbs and head. Consciousness is not lost, although it may be impaired. The tongue is not bitten, but the patient may bite her own lips or hands, or other people and things. Talking is common during the fit, and the patient may tear her hair out in handfuls. Incontinence of urine and faeces does not occur. The attack may last from several minutes to an hour. It ends commonly with a paroxysm of weeping, and the passage of a large quantity of pale urine. The patient may appear to be quite unaware of what has occurred. During an attack, the points described under epileptic convulsions (p. 386) should be noted and recorded if the doctor is not present.

Treatment.—The cause is treated. The patient should lead a quiet, regular life away from home if possible. She should have regular employment of a suitable and congenial nature. A daily bath with cold douching to the spine is advisable. Nourishing food, tonics, and fresh air are necessary. In severe cases in which this treatment is unsuccessful Weir Mitchell's treatment may be prescribed. The nurse requires to exercise patience and tact, and can do much by being kind yet strict, just, encouraging, and sympathetic with discretion. Patients with moral perversion require especial vigilance. Deception may cease when the patient finds the nurse will no longer trust her.

Hypochondriasis.—A chronic nervous disorder marked by mental depression, which is due to a needless anxiety about health. Men are more commonly affected than women. The patient can think of nothing but his health; he either fancies he is suffering from some disease or else attaches great importance to trifling and unimportant symptoms. The condition may be such as to amount to a slight form of insanity. The patient spends his time inspecting his tongue, his evacuations, consulting endless doctors, and trying innumerable cures or treatments.

Treatment.—Any possible cause is treated. A healthy life should be led with plenty of occupation or hard work. The patient should be told that there is nothing the matter with him and should be discouraged from thinking or talking of his imaginary ailments.

Neurasthenia, or Nervous Exhaustion.—*Causes.*—Exciting causes are over-work, mental strain, shock, alcohol, the drug habit (p. 382). Predisposing causes are bad health and temperament.

Symptoms.—The symptoms are variable and numerous, the commonest being: Irritability of temper, unsound judgment, anxiety over trivial matters, headache, vertigo, insomnia, or bad dreams. The patient may act on impulse instead of reason. Depression of spirits with distaste for social intercourse may be present, or there may be a craving for diversion and excitement with unusual talkativeness. The motor nerve-centres are over-stimulated and uncontrolled, the patient moves or works with undue haste in an unsettled manner and is unable to sit still or concentrate thought and action for a normal period of time. The sensory nerve-centre may be affected, the patient being unduly sensitive to light, noise, heat, and cold. Digestion may be impaired, causing flatulence, constipation, diarrhoea, or vomiting. Palpitation (p. 276) of the heart, blushing, flushing, and profuse perspiration are common symptoms. When talking the patient may appear incoherent, frequently and illogically changing from one subject to another. In other cases the patient is melancholic (p. 403) and emotional; the countenance is altered, the eyes appear weary, and there may be slight ptosis. The patient appears miserable, and when he talks he does not look any one full in the face; the tone of voice is whining or aggrieved and does not alter whatever the subject under discussion may be. Reading and talking soon tire him. In other cases the symptoms are more local and tend to attack any part that has previously suffered from injury or disease. Loss of weight is marked in almost all cases; the patient may become reduced to an emaciated condition very rapidly. In the later stages a condition of collapse with extreme inertia may supervene, or the patient may become delirious or demented from loss of sleep. Tremor (p. 361) may be present.

Treatment.—The cause is treated and removed if possible. The general health is attended to, the patient leading a regular life and avoiding all excesses. Nourishing food in abundance is essential. Tonics and sedatives such as bromide and valerian are prescribed. The patient should not be allowed to think too much of his feelings, or magnify his ailments, and for this reason a suitable employment or amusement is useful to distract his thoughts. A sea voyage is sometimes beneficial. In the more severe cases the Weir Mitchell treatment is prescribed. After a course of this treatment a change of air to a bracing climate, with regular occupation or amusement, is advisable. Excitement and over-fatigue are to be avoided for some time after a cure is established.

CHAPTER X

MENTAL NURSING

Special Qualifications needed for the Mental Nurse.—The right nursing of a case of mental disease or a case of bodily disease with marked mental symptoms may demand qualities and experience in the nurse of a very special kind. As mind transcends body, so the derangements of the mental functions of the brain exceed any bodily diseases whatever in difficulty of management. They are more obscure and more subtle in their nature, and are often more terrible in their manifestation. In almost all bodily diseases the patient knows that he is ill and aids the nurse; in by far the majority of mental cases the patient either does not know, or will not admit, that there is anything the matter with him. He frequently not only resists treatment and control as being unnecessary, but resents them as being insulting and injurious to him. To be thought and treated as insane excites in most insane patients as much, or more, anger and opposition than it would in sane people; and yet the nurse must try to gain the confidence and disarm the opposition of her patients. There has grown up in the minds of men, in the course of past ages of ignorance, such prejudices and misconceptions, such dreads and repulsions about ' madness,' that they even now, in this scientific and philanthropic era of the world's history, cling to everybody and everything connected with insanity. We know insanity to be simply a disease of that part of the brain through which mind is exhibited—a disease, in fact, of the very highest organ of the body —yet it is commonly regarded as being in nature and in its treatment entirely different from any other disease. It is, no doubt, the saddest and often the most terrible of all diseases; but this should surely evoke all the more sympathy and study on the part of all who have to do with it, rather than repulsion. Two things the mental nurse should from the first set herself with all her might to do. One is to try to consciously realize that every symptom present, every incoherent word, every depressed or excited emotion, every foolish or violent act, every delusion, results from a disease of the brain, just as the cough, the pain, and the expectoration in the case of pneumonia result from a disease of the lungs. Her other aim should be to mitigate and remove the popular reproach of the disease, embittering as it does all the real sadness to relatives and to the patient when he recovers, as well as adding many special difficulties to its treatment.

Mental nursing is gradually working its way into the great department of general nursing, a special training, examination, and certificate are now provided for nurses wishing to undertake mental work.

To become a really first-class mental nurse the following qualifications are necessary: Good health and equable temper, youth, power of observation, intelligence, kindness of heart, unselfishness, great patience, a pleasant manner, tact, large firmness and power of insistence, average strength, great staying power, coolness, force of character, and an instinctive knowledge of human nature. In addition to the above there is needed, in order to attain the very highest excellence, a certain inborn qualification difficult to describe. It consists in having a special knack of dealing with mental cases, of observing the mental changes that occur in them for better or worse, and a subtle power over the patients by word, look, and manner. Persons with this faculty get on well with mental patients from the first; they are not afraid of them, they have an innate tolerance for the disagreeableness of many of the insane, they have a soothing manner, and instinctively know the weak points of their cases. Commonly they do not get hurt or knocked about by even very obstreperous patients, and easily get them to do things when others cannot. It is a faculty possessed by very few.

In a general way the person who gets on well with children, ruling them firmly yet gaining their confidence and liking, is the one who is most likely to get on with those who suffer from mental disturbances, great or small.

The following conditions should debar persons from taking up mental nursing: A strong heredity of insanity, as this entails a risk, not of any direct mental 'infection,' but, by suggestion, of morbidness, and of weak mental points being brought out by the constant grooves of abnormal speech and action in which the patients run.

There is also to be considered the excessively wearing and exhausting work, to the nurse, of a long-continued case. A 'nervous' person, a highly sensitive person, a person who cannot control her temper, and a person who gets 'run down' for slight causes are not suitable persons; and no one who has an instinctive shrinking from insane people should undertake the work.

General Rules and Hints for Mental Nurses and Attendants.—Every bodily symptom, and everything that relates to the bodily functions and health (Chapter V), must be attended to and reported to the doctor, whether they seem important or not, for the brain suffers from every bodily disorder. Many mental symptoms in insanity are just exaggerations of what is normal in mankind, most men and women being more or less subject to depression or elevation, to fancies and whims, to temper and suspicion, these being the foundation of melancholia and mania, of delusions and insane impulse. Sleep (p. 210) is of very special importance to the mental patient, for during sleep the brain rests and heals.

The mind of the patient is most commonly fixed on himself or on morbid thoughts and feelings within him, therefore it is necessary to use all endeavours to take him 'out of himself' and direct his attention to healthy work or amusement.

Many of the insane are cunning and selfish, and have not the delicacies of feeling and the pleasant manners and conventionalities of civilized life. Set yourself to look on these things as mental symptoms of disease and do not resent them.

Insanity is commonly accompanied by a tendency to disorder and dirt, to unsociability and idleness; therefore look on order, tidiness, cleanliness, work, and pleasant talk as mental medicines necessary to cure the disease. It is a safe rule to refer any 'temper,' or any strange behaviour whatever of a patient, to his disease.

Watch your patient's speech, movements, eyes, and mental condition, comparing one day with another, and noting any changes; but do not allow the patient to feel he is being continually watched.

Gain your patient's confidence by every means. Mean what you say, and don't deceive him; he will not trust you otherwise, and your influence will be gone. Don't argue with, laugh at, or contradict a delusion, but turn the subject. Infinite patience and tact will be needed. Always try persuasion and explanation if resistance is offered to dress, to take food, to walk out, etc. A dogged unreasoning resistiveness is very common in certain melancholic and other patients. To overcome this without loss of temper or using violence is the triumph of mental nursing. If force has to be used to overcome resistance and violence, let it not be used single-handed if possible. Make the force overwhelming, and use it without fuss, or bluster, or temper.

Don't show any fear with a patient who seems dangerous, but quietly be on your guard and adopt all reasonable and commonsense means to lessen danger, putting away knives, etc. You have the right to protect yourself. Many patients have delusions that influence their conduct which they will conceal for a long time. It is hard to go on treating an ungrateful patient as you would a grateful one; force yourself to do so.

If a patient takes a rooted delusional dislike to you, suggest that another nurse be got to take charge.

Be careful what you say in the hearing of even acutely maniacal or stuporous patients, for many such will remember and resent remarks which at the time they seemed not to have heard or attended to.

A suicidal patient is on the whole the most responsible case to be dealt with. Neither the relatives nor the doctor will readily forgive a suicide, nor can one forgive oneself if it occurs through carelessness. The only safe rule is, never to leave such a patient without someone being with him. Take keys out of doors, have stops put on windows, remove knives and weapons, look out for fire, and have the rooms in which the patient lives and sleeps on the ground floor if possible. Remember such patients are often cunning, ingenious, persistent, and most determined in their efforts at self-destruction. Never trust them without doctor's orders.

When you feel done up and exhausted, and, therefore, not so alert and careful, ask for a spell off duty, in case an accident happens.

It is always well to know what most patients have in their pockets, e.g. weapons or poison. Find this out at once whenever in charge of a case. Find out as soon as possible the special and most marked tendencies of each patient.

Do not be tempted to use your power over your patient dictatorially or selfishly, but justly and for his good only. In certain cases treated at home or in lodgings you are entitled to ask if there is legal authority to control the patient and interfere with his or her liberty, and to get this in writing from the nearest responsible relative.

Be most careful in your intercourse with the relatives of patients, and watch the effect of the relative's presence on the case; often it aggravates the symptoms. Always be loyal to the doctor, who will uphold you in your legitimate position. Relatives may be suspicious, fussy, obstructive, interfering, over-zealous, over-sympathetic, jealous, foolish, and disloyal; they may try to undermine your influence and to disregard medical instructions. On the other hand they may be loyal, sensible, and have a good influence on the patient.

Keep a note-book, and put down in it everything of importance in a systematic manner day by day.

To ill-treat or neglect an insane person is a far worse offence than to do so to a sane person, who can complain. Such neglect or ill-treatment is severely punishable by law.

Endeavour to look on mental disease as you would on any ordinary disease and show others that you do so.

Put it to yourself when you feel inclined to be angry, or disgusted, or worn out with the persistence of troublesome symptoms: ' If the patient was my brother, what should I expect of his nurse? '

General Principles of Treatment.—In the ' general treatment ' of mental diseases far more stress has to be laid on the general conditioning of the life of the patient and on his environments, and their direct effect on his mental symptoms, than in the treatment of the acuter forms of bodily disease. The nursing and the treatment in many cases consist largely in systematically arranging conditions of life, hours, diet, occupation, amusements, exercise, and other conditions that will antagonize and counteract the mental symptoms present, and so act as mental medicines. All peculiarities of thought, word, and deed must be looked on as symptoms of a disordered brain, which are to be treated by appropriate mental medicines and counteractives. It should be borne in mind that the patient is impelled to action, not by ordinary ' motives ' but by disorder in the working of the brain-cells. This is difficult to realize at first, for the idea that conduct results from adequate motive is so innate in man, and the idea that every man must be held ' responsible ' for his speech and conduct, and must necessarily be able to control them by an act of will on his part, is so natural that it is often difficult not to blame, reprove, and be angry with a patient who, from a disorder in the physical mechanism of the brain, strikes, abuses, or spits in the face of the attendant. The speech and action of an insane patient often look so like bad temper and vice, which he ' could help ' if he liked, that the anger and resentment proper and natural in the circumstances in dealing with men and women of sound mind are most difficult to restrain. It should be remembered that the power of self-control—mental inhibition—is a brain quality as well as a moral faculty, and that its existence depends on brain soundness; self-control and other mental and moral faculties may suffer impairment without being completely lost. Nothing is more difficult than to say the extent to which a patient is able to control himself.

The nurse needs to realize that ' mind acts on mind ' in all sorts of direct and subtle ways, apart from any mysterious ' telepathy ' or ' mesmeric ' influence. The speech and manner, the tone of voice and its bearing, the interest in the patient's symptoms, and the persistent efforts to rouse interest must be regarded as most effective medicine to the patient. The more the patient can be managed by mind, i.e. by persuasion and tact, and the less by physical force, the better it is for him and for the nurse. Persuasion, reasoning, and tact should always be tried first; force to be used only in case of their failure.

A mental patient may present none of the symptoms associated with a sick person, he may appear strong and muscular, may, indeed, exhibit an almost unnatural strength; he is not confined to bed nor to the house, but, on the contrary, may need walking in the open air as the sheet anchor of treatment. Nearly all mental cases have bodily symptoms of some kind or other, as well as mental disturbances, and these must be looked for (p. 183), as they often require treatment. The part of the brain whose function is 'mentalization,' and which has become diseased in insanity, has also intimate relation to every bodily organ and function. The lungs, the heart, the alimentary canal, the reproductive organs, are all controlled by the mental centres in the brain, which have direct nervous connection with them. This influence is not all on one side, however, for these organs can and do send up influences to the mental centres in the brain that produce joy or irritability, excitement or depression, bravery or cowardice, morality or immorality, strength or weakness of will. It is therefore necessary to keep a constant watch for diseased and abnormal relationships between them. If the mind-centres in the brain are excited there may be raised temperature, constant muscular action, palpitation of the heart, derangement of digestion and the bowels, sexual excitement—all these arising from brain disorder; or there may be, in the case of morbid depression in those centres, a lowered temperature, skin irritation or dryness, a lowered heart's action and weak pulse, indigestion, constipation, impotence, or a loss of flesh with an impaired nutrition of the whole body, causing loss of body weight. On the other hand these organs may have been diseased in the first place, and from a consumptive lung, or a diseased heart, or a disordered stomach, liver, uterus, or kidneys, a secondary attack of melancholia or mania may result.

An important fact to be borne in mind by the nurse is that all kinds of bodily symptoms (p. 183) of the greatest gravity may arise in a mental patient, and may never be complained of, and show no evident signs until they are sought for. They are masked by the state of the patient's brain, which prevents him feeling anything or complaining of it if he does feel it. Another feature present in many forms of mental disease is, a special aggravation of existing symptoms or a development of new symptoms when night comes on as compared with day.

The brain being the organ, not only of mind, but of bodily feeling, of muscular movements, of heat production, of sleep, and of the regulation of the nutrition of the body, mental diseases have as an essential part of them in many cases the bodily symptoms of pain or the absence of feeling, of constant movement, of incomplete or incoordinated and paralysed movements, of high and low temperature, of insomnia, and of disorders of all sorts of bodily functions. Sleeplessness is a characteristic of all the acute forms of insanity and also of many of the chronic forms. The brain is always lowered in tone and action at night; in mental disease this is exhibited by noise, by delirium, by special delusions, by dirty, degraded habits, by tearing the bedclothes, and by many other ways.

The mind is chiefly expressed in the eye, the features, and in the speech. The muscles that give ' expression ' (the eye and the face) and that produce tones of voice are the chief and most intimate 'mind muscles.' The variety of mind is represented by the variety of features and eyes in human beings. Mind is expressed, too, though not so accurately, in modes of movement, walking, and in attitudes.

Baths form an important part of the treatment of many forms of mental disease (p. 115). Patients suffering from various kinds of motor excitement are frequently treated by prolonged bathing. The water is maintained at a constant temperature (98°-105° F.), and the patient lies in it half an hour the first day, one hour the second, two hours the third, and so on, up to six hours or more. The time is then gradually reduced. The cold shower, aerated, and foam bath (p. 115), the wet pack, the vapour bath and hyperthermia (p. 113) are also sometimes prescribed. (For method of administration see Chapter III.)

Drugs.—These are necessary for the cure of the various bodily ailments from which the patient may be suffering, and are those usually given for the condition. Drugs are also required in many instances to produce necessary sleep, those most commonly used being bromide, paraldehyde, chloral, bromidia, luminal, medinal, dial, and soneryl.

INSANITY

CLASSIFICATION OF MENTAL DISORDERS

Mental diseases present an extraordinary variety of symptoms. One case may be so unlike another that they would appear to have little in common. They differ in form, in degree of intensity, in duration, in curability, and in treatment.

The classification of the various forms and varieties of mental diseases has been made on two principles. One is a mental classification taking account of mental disturbances primarily; the other taking account of the bodily states and symptoms primarily.

Mental Classification.—(1) *Melancholia*, or states of mental depression.

(2) *Mania.*—All states of mental exaltation and excitement.

(3) ***Dementia***, or all states of permanent mental weakness, or silliness, without depression or exaltation.

(4) ***Monomania***, or delusional insanity.—States without much depression or exaltation, but in which insane delusions are present in marked intensity.

(5) *Volitional insanity*, or impulsive insanity.—Where, without much depression, excitement, or delusion, the normal will has lost its power over speech and action.

(6) *Stupor*.—Where there is utter lethargy, trance, apathy, and want of attention to anything.

The Bodily or Clinical Classification comprises a long list, but only the most important are included here:

(1) *General paralysis* (p. 406).
(2) *Ordinary paralytic insanity* (p. 407).
(3) *Epileptic insanity* (p. 407).
(4) *Alcohol insanity* (p. 407).
(5) *The insanities connected with pregnancy, childbirth, and nursing* (p. 408).
(6) *The insanities of the times of life* (p. 409).
(7) *Senile insanity* (p. 410).
(8) *Idiocy and congenital imbecility* (p. 410).

MENTAL CLASSIFICATION

1. **Melancholia.**—The keynote of this disease is morbid disturbance of feeling rather than of thinking. The patient suffers mental pain without outward cause. It usually comes on by a loss of flesh, sleeplessness, a want of keen enjoyment of food or anything else. The human-nature feeling or organic satisfaction in life and repulsion against death gets lessened or lost. The patient, from ceasing to enjoy, soon passes on to the further stage of constant active unhappiness and intense misery. He first imagines, for instance, that he has not done his work well, then that he has cheated his friends, or if the religious form is present, that he has committed some great sin, then that he is being watched and that the police are after him, then that he will disgrace his family, and then, to escape this, he attempts suicide. The risk of suicide is, in fact, the ever-present danger, the never-to-be-forgotten fact in the treatment of melancholia. In four-fifths of all the cases it is present, and it may come on suddenly and without warning. It may take every sort of form, and relatives will never be got to realize that such a thing is possible until an attempt is made and precaution is vain. Because it was so utterly ' unlike ' the patient, they cannot

think it can ever happen. The possibility of disease changing the affections, the habits, and the character seems a fact that many people cannot take in or believe (p. 1). Suicide is often suggested by seeing the means at hand. Some patients cannot look at knives, the sea, a height from which they might cast themselves, or a train, without an impulse towards suicide or a fear of it coming over them. Great cunning and ingenuity and the strongest determination are often exhibited in accomplishing the object.

In addition to suicidal attempts, melancholic patients exhibit intense obstinacy and tremendous selfishness, and most of them have delusions of a depressing kind and very commonly of a religious type. Some of them labour under intense excitement, with restlessness, noise, groaning, wringing of the hands, shouting, tearing clothes, and violence. Some few are homicidal and dangerous, attacking those about them furiously.

A mild case of melancholia is just a person out of spirits and unable in consequence to attend to his work, a condition often called 'nervous break-down.' They need rest, company, change, mild occupation, and amusement, an open-air life, sunshine, tonics, and a suitable diet. Usually a light fattening diet is the best, with eggs, fish, fruits, white meats, and sometimes the lighter wines or malt liquors. These cases are the most frequently nursed at home, or at a nursing home, or, at all events, are not sent to hospitals for the insane. More severe cases need far closer watching, especially if there is any suicidal or obstinate tendency present; these patients come under the category of 'borderland' cases. Mild melancholics are often sent on sea voyages. This often cures, but it is a most responsible position to have charge of such a case on board ship.

More than half the cases of melancholia recover. Practical points to remember when nursing these cases are: most patients are worse in the morning, and most suicidal then, and the greater number of suicidal patients think of and attempt suicide by one special means, neglecting others.

2. **Mania.**—Like most forms of insanity, mania often begins by some depression, which gradually or suddenly passes into a restless unsettledness of mind, with a morbid elevation of spirits in some cases, or a morbid irritability increasing to anger or rage in others. Mania is always accompanied by excitement, that is, by bodily restlessness and a loss of muscular control, or a tendency to these. Mania differs enormously in degree of intensity in different patients. In some cases it shows itself simply in unusually high spirits, with restlessness and much loss of self-control; in others—'acute mania'—it amounts to acute delirium, total in-

coherence of speech, with no consciousness or memory present at all. The acuter varieties of mania run down the strength and flesh quickly, just as a fever does; this is one of its dangers. In mania, patients are more apt to be dangerous to others than to themselves. Maniacal patients almost always have insane delusions in addition to and often as part of their mental excitement. The delirium of many fevers may be mistaken for mania unless the clinical history of the case is taken into account.

Mania is a curable disease. Walking in the open air ' to let off steam ' and to produce sleep, careful and constant feeding to keep up the strength, are two of the great principles of treatment. The patient's habits and ways need to be most carefully watched, and, if possible, corrected. These patients may be destructive, dangerous, dirty, untidy, noisy, irritable, delusional, offensive to decency and utterly changed from their normal selves—all these symptoms have to be dealt with and corrected if possible. Some of the milder cases of slight excitement with acute reasoning and high spirits, but little common sense and self-control, are very difficult to manage; some of them are homicidal in an impulsive way, or from delusions.

3. **Dementia** consists of mental silliness, loss of energy, and of ' character,' of individuality, of power of feeling, with a degradation of habits (these things being stamped in the expression of face), and a lowering of the moral nature, an impairment of all the higher powers, and often a diminution of memory. When cases of melancholia or mania do not recover, they usually pass into dementia, which is an incurable brain state—a virtual mental death. Most demented patients are liable to become excited at times. The treatment consists largely in keeping up the bodily health—a fat dement is less troublesome than a lean one—correcting the habits, and keeping the patient occupied in some simple way or other.

4. **Monomania**, or *delusional insanity*, is that form of mental disorder in which patients, without much depression or elevation of mind, believe themselves to be very powerful or rich, to be kings or queens, or that they are persecuted, or that unnatural unseen agencies—such as gas, electricity, spirits—act on them. When such a condition has lasted long it is nearly always incurable. These patients are commonly difficult to nurse and to manage. The delusions (p. 861) may be quite harmless or extremely dangerous. The first thing in the treatment of these cases is to ascertain if there is any bodily cause for the delusions. A delusion that the food is poisoned may be caused, as in alcoholics, by an irritation of the stomach from drink. Some cases are irritable and delusional from liver derangement, indigestion, or constipation; they are being

poisoned by their impure blood, and so have a sense of organic discomfort which they interpret wrongly, and attribute to outside causes, such as poison, electricity, mesmerism, etc.

5. **Impulsive Insanity**, or insane impulse, is a very interesting and important variety, but it is rare in its typical forms, i.e. when the intelligence is perfectly good and the feelings normal, but the will morbidly disturbed, so that the patients commit acts of violence, steal, set things on fire, drink to excess, and even take away their own lives or those of others, knowing that those acts are wrong, but not having the power to control them.

6. **Stupor** is a variety of mental disease in which there is complete lethargy, with no outward response to what is said or done to the patient. There is no desire, no emotion, no thought, no attention, or there is no outward sign of these. It covers the conditions called trance and catalepsy (p. 393), and is like the condition of a person hypnotized or sleep-walking. A few of these patients, though they show no sign at the time, remember all that has passed when they recover. There is usually great feebleness of the circulation in cases of stupor, the pulse being small and weak, and the body cold. They need warmth, much woollen clothing, massage, and plenty of easily digested warm food and glucose. Many of these patients recover. It is necessary to see that all the bodily functions are properly performed (p. 186), the patient not being able to make any complaint or request. (For general nursing see Chapter IX, p. 212.)

BODILY CLASSIFICATION

1. **General Paralysis.**—A progressive disease in the highest region of the brain, caused by syphilis (p. 322), which goes on from bad to worse, soon killing the patient. The disease goes through three stages, it affects the speech and all the muscles of the body as well as the mind. It affects men far more commonly than women.

1st stage.—The patient commonly begins by being much excited, and with delusions of grandeur. He imagines himself very strong or enormously rich; he is sleepless, destructive, and restless; he is often impulsive and dangerous when contradicted, and his articulation of difficult words is slightly damaged (p. 364).

2nd stage.—The intense excitement abates, but his speech gets worse, and he develops an unsteady gait.

3rd stage.—The patient in this stage sinks into a most helpless, mindless condition, walking is impossible, and speech very nearly so; incontinence of urine and faeces is present, and bedsores (p. 17) are very liable to form. Death usually occurs in from one to three years. During the course of the disease, the patient is subject to 'congestive attacks,' often accompanied by violent convulsions and a very high temperature (p. 195). Very careful nursing (p. 357), skill, tact, and infinite patience are required. The patient is at first very dangerous. Later, when the helpless stage is reached, the food must be minced to prevent choking. Catheterization (p. 66) is often needed during the third stage, and unceasing attention and good nursing are required to keep the skin dry and clean, to remove pressure from bony prominences, and prevent bedsores (p. 17) and to administer food, which will require to be liquid only during the later stages (p. 54). The bones are brittle, the skin and flesh soft, and there is noise at night in all stages of the disease. Fever therapy has proved successful in some of these cases; the treatment is described on p. 324.

2. **Paralytic Insanity.**—The mental failure that usually accompanies strokes of paralysis, apoplexy (p. 377), and softening of the brain is usually of the nature of dementia, and is mental weakness from actual gross destruction of a part of the mind organ. There is usually night noise and restlessness, with much irritability, childishness, and loss of self-control. It is often complicated by senility and the ordinary symptoms of dotage.

3. **Epileptic Insanity** is that which frequently accompanies epileptic fits (p. 387). It is commonly of a very furious, dangerous, and unmanageable kind, many homicides being committed every year by epileptics. Delusions, temper, quarrelsomeness, vivid hallucinations, impulsive action, unreason, and violence are all apt to occur after or before an epileptic fit (see automatism, p. 388). The utmost caution is needed in dealing with an epileptic affected in this way. These patients are commonly quite rational in conduct for a time, then suddenly become dangerous. Frequently epileptics have a craving for alcohol, which always aggravates the condition and often brings on irritability and homicidal impulses. Dementia results from prolonged epilepsy. A sharp purge will often stop an attack of epileptic mania. (For treatment of epilepsy see p. 387.)

4. (*a*) **Alcoholic Insanity** is, unfortunately, of lamentable frequency in this country; over-indulgence, in fact, being the most frequent single cause of mental disease. Steady soaking is more harmful to the mental functions of the brain than bouts of drinking with intervals of sobriety. There are various forms of alcoholic insanity. The most acute form is delirium tremens, in which there is complete loss of control, intense restlessness, vivid hallucinations of sight, often suicidal impulses, complete loss of appetite, sleeplessness, and very weak action of heart. The most careful watching

is required, with persistent attempts to give nourishment. The patient appears strong but in reality is very weak, and often dies suddenly (p. 359).

Chronic alcoholism always has mental symptoms often amounting to insanity. It is less acute, but more persistent than the acute variety. It is characterized by morbid suspicions, often of poison and of conspiracy; a paralysis of the social instinct; hallucinations of hearing; shakiness of walk, of speech, and of writing (see multiple neuritis, p. 361); sometimes there is violence and morbid impulsive actions. Abstinence from alcohol, good food, tonics, fresh air, and some occupation, and pleasant companionship of the nursing and supervisory kind, greatly help recovery in this disease; but if the brain has been soaked in alcohol too long its structure becomes organically affected, and complete recovery of mental power becomes impossible.

(*b*) **Dipsomania.**—This term is properly applied to describe, not an insanity caused by alcohol, but an uncontrollable craving for alcohol that may or may not be complicated by acute or chronic alcoholic insanity. The craving may be for drugs, such as opium, cocaine, or chloral (see drug habit, p. 382).

5. **The Insanities connected with Reproduction.**—*Puerperal insanity.*—The most important of these are the insanities connected with childbirth (p. 693). There are other forms with diseased and depraved sexual habits and impulses, which are difficult to control, very persistent, and often very disgusting to have to treat. Such morbid habits complicate many cases of other forms of insanity, but are much more frequently a symptom than a cause of the mental illness. They indicate the general loss of control which is one of the chief symptoms of mental disease.

During pregnancy (p. 690) the tendency to mental disturbance, when it occurs, which is rarely, usually takes the form of melancholia, often suicidal. Most of the cases recover after delivery. After childbirth (p. 712) a very acute form of insanity—puerperal insanity—in fact the most acute of all, is not uncommon. It occurs usually within the first fortnight after delivery.

Symptoms.—Intense delirium, with noise, violence, and delusions, intense aversion to food, a weak pulse, a high temperature, an exhausted bodily condition, and sometimes suicidal tendencies. As this state is very curable, and in many cases of short duration under proper treatment, mental nursing at home is usually tried by those who can afford it, before removal to an institution is decided on. Food and stimulants form the chief treatment. To restrain violence, to keep the patient in bed, and to administer food (p. 54), stimulants, and medicine (p. 758), to give vaginal douches (p. 71), often need all the skill and strength of two or three strong nurses. Improvement generally takes place after the first fortnight, but some cases run on for months. Overnursing of children causes, especially among the poor, a form of mental disturbance—*lactational insanity*—which is not nearly so acute as puerperal insanity, and is almost as curable. There may be suicidal intentions, and there is apt to be mild depression or mild excitement and aversion to relatives. Good food, tonics, and fresh air, and a change from home, are the chief indications of treatment.

6. **The Insanities of the Times of Life.**—The great physiological periods of human life are each attended by certain risks to the mental balance. During development from puberty into adult life—that is from fifteen to twenty-five or so—it is not uncommon to see various nervous diseases in young persons of both sexes who have heredity to nervousness; chorea, hysteria, epilepsy, aggravated bad temper, incompatibilities of every sort, causeless dislike to relatives, and adolescent insanity, are the most common of these.

(*a*) **Adolescent Insanity** is most frequently met with from eighteen to twenty-five. It usually takes the form of mania, more or less acute, which has a tendency to abate and then recur over and over again for months. A majority of the cases recover under proper treatment, which consists of much walking and work in the fresh air, quantities of milk, bread and butter, fruit, vegetables, and a minimum of animal food. Close supervision of habits to prevent masturbation is necessary (p. 596). As the patients recover they fill out in body, the changes in growth which occur at puberty are noticeable, and they otherwise show that they have passed the dangerous intermediate stage between puberty and adult life. Adolescent insanity is apt to be accompanied by all the special mental and moral characteristics of the young man or woman in an exaggerated and morbid form.

(*b*) **The Climacteric or Menopause** (p. 687), or *change of life*, is often attended with mental risk. The symptoms in these cases are commonly depression of spirits with groundless fears, loss of courage, of power of initiative, and of affection, loss of flesh, sleeplessness, a bad colour of the skin, flushings, night-sweats, impairment of appetite and digestion. Cheerful nursing, a change to sea or mountain air, good food, a little employment and amusement, with patience and quiet waiting till nature has passed this critical stage of life, are the indications of treatment. A preparation of the ovarian hormone (oestrin) (p. 289) is often prescribed with success. It is well to explain to the patient to what her symptoms are due, and to assure her of recovery when the stage is over if she will assist by not allowing, or by controlling, morbid thoughts and feelings.

(*c*) **Senile Insanity.**—In old age the brain always loses more or less force. In some cases a troublesome and sad mental breakdown occurs, senile insanity, not ordinary dotage, but a sort of acute dotage, characterized by disregard of decency and cleanliness, loss of power to recognize home and relatives, and an irritable violence. This state is always very painful to relatives, and often most troublesome to manage. Treatment consists in watching, soothing, giving food and sedatives to tide over the brain-storm until dotage or death occurs.

7. **Congenital Imbecility and Idiocy** (p. 607) are deficient mental states, the result of a non-development of the mental part of the brain dating from birth, or soon after, and may partly be caused by disordered function of one or more of the endocrine glands (see p. 287). Their treatment largely consists in remedying any disorders of the endocrine glands by treatment (p. 296) and in endeavouring to develop the body and muscles by feeding, regulated exercise, simple games, and suitable trades, in giving plenty of good simple food, in fresh air combined with warmth, and by a simple and special education through the senses. Some of this class can be greatly improved in mind and body and in happiness, and can even be made useful members of society. The treatment is really educative on medical and physiological lines; but, in nursing and treating these cases, it must ever be kept in mind that the whole organism is weak as well as the brain, and needs extra care all round. Many of these patients die from tuberculous disease (p. 318).

THE MENTAL SYMPTOMS OF BODILY DISEASES

There are few bodily diseases that do not in some way or other affect the mental condition of the patient. Special diseases are apt to have special mental symptoms, not, of course, amounting to insanity or having anything to do with it. The mental symptoms or state of the mind in disease (p. 357) are especially seen by the nurse. The patient rouses himself, and does not always show his real state to the doctor. The effect of mind on body is striking, and is most important for the nurse to observe. Many a patient dies, not because his disease is necessarily fatal, but because it has lowered his mental energy so that he does not care to live. At night the mental and nervous tone is apt to be specially low in disease as compared with the day, and therefore almost all diseases are then at their worst, and death takes place most frequently at that time, hence the need of observant night nurses.

CHAPTER XI

THE NURSING OF DISEASES OF THE SKIN

General Treatment.—Skin diseases, in general, are uncomplicated by marked constitutional disturbance, but on the other hand complications may arise which may endanger the patient's life. External treatment is, of necessity, most important; the principal qualifications of a dermatological nurse are that she be trained in patient and careful observation, to give an accurate and painstaking history of her cases, and an intelligent account of her work. The treatment of chronic persistent cases is prolonged and trying, therefore determined conscientiousness and patience are necessary to resist the inclination to weary of the perpetual dressing with no apparent result. Untiring gentleness is the greatest qualification. The importance of cleanliness cannot be over-estimated. It is essential to the recovery of the patient, because the discharge and vapour being laden with the germs of disease are directly harmful, therefore absolute cleanliness must be insisted on in all skin work. Special sheets should be set apart for patients using tar or chrysophanic preparations; the latter stain the sheets an inky-purple colour, and destroy them very quickly.

Care must also be taken that the bed is protected by a sheet of mackintosh, fastened at the corners by safety-pins to prevent creases, which mean considerable discomfort to the patient. Over the mackintosh a double thin blanket should be laid; this will absorb any excess of ointment or moisture, and also help to counteract the heating effect of the mackintosh upon the skin.

Rest in bed and low diet are obligatory in acute and subacute affections. A saline aperient is generally prescribed to be taken every morning before breakfast.

No stimulant should be given unless expressly ordered by the doctor in charge; but in this, as in all other matters, each patient requires individual consideration.

Cod-liver oil, malt, and tonics are frequently prescribed. It is not possible to exaggerate the responsibility of a nurse with regard to poisons and external remedies, which should always be kept in fluted coloured bottles, properly labelled, and in a separate cupboard under lock and key. The principles of dermatological treatment are, to soothe when inflamed, to stimulate when chronic, and an alternative plan when deemed necessary.

The administration of medicated baths is of great importance in many cases of skin disease; but the sanction of the doctor is always necessary before a bath is given. (For medicated baths see p. 117.)

For descriptions of rashes, colour of skin, etc., see p. 188.

ABNORMAL CONDITIONS OF THE NAILS

Atrophy of the Nails.—The nails become dry, brittle, thick, discoloured in organic disease of the spinal cord (p. 367); after inflammation or injury of the peripheral nerves (p. 365); after prolonged febrile disease, such as typhoid (p. 341); and in certain skin affections involving the matrix of the nail.

Curving of the Nails.—This condition is generally associated with clubbing of the terminal phalanges, and occurs in phthisis (p. 257), wasting diseases, and chronic disease of the heart (p. 271).

Paronychia, Onychia (Whitlow).—An inflammation of the matrix of the nail. It may result from injury, organic disease of the spinal cord, and from cutaneous affections involving the matrix.

CUTANEOUS EMPHYSEMA

The term is applied to the presence of air or gas in the subcutaneous tissues. It appears as a diffuse swelling which yields a peculiar crackling noise on pressure (see crepitus, p. 191). It may result from injury (p. 536), or rupture from ulceration of some air-containing cavity such as lung, oesophagus, stomach, intestine; or in rare cases from the presence in the tissues of gas-producing bacteria (p. 574), as occurs in gas gangrene.

DISEASES OF THE SWEAT GLANDS

Anhidrosis.—A condition in which there is a deficiency of sweat. It is commonly present in cases of Bright's disease (p. 241); it may also occur in certain skin affections.

Treatment is directed to the cause.

Hyperhidrosis (excessive sweating); **Bromidrosis** (excessive sweating, the excretion being accompanied by a foetid odour).—*Hyperhidrosis* as a general condition is often present in phthisis—night-sweats—and in other diseases characterized by marked debility.

Local hyperhidrosis is most frequently observed in the hands, feet, and axillae, and may result from a derangement of the sympathetic nervous system. Unilateral sweating of the face may be due to an aneurysm (p. 278) or tumour pressing on the cervical sympathetic nerve.

Bromidrosis is often associated with hyperhidrosis, and is common in acute rheumatism (p. 309).

Local bromidrosis is usually confined to the feet.

Treatment.—The cause is treated, the general health is attended to. In the general condition, local internal remedies may be prescribed. The patient should be bathed or sponged over twice a day, then sponged with methylated spirit and a dusting powder applied such as talc, or equal parts of starch, boracic, and zinc powder.

For local bromidrosis of the feet the following treatment is required: The feet should be washed twice a day with plenty of soap and water, then rubbed with spirit and powdered. Clean socks or stockings should be worn every day and they should not be of a thick woollen nature. The clean hose should be dusted with powder containing boric or salicylic acid before being worn. The shoes must be changed at least twice during the day, and in the interval should be left airing out of doors.

Sudamen.—A cutaneous affection, characterized by the eruption of minute vesicles, resulting from the retention of sweat in the upper layers of the skin. It may be observed in health in persons who perspire freely. It is frequently noted in febrile diseases (p. 195). The rash (sweat rash) appears as minute, irregular, translucent vesicles called *sudamina*. They are not surrounded by an inflammatory areola. They do not rupture, but dry up and are followed by slight desquamation (p. 189). The affection requires no treatment beyond that given for hyperhidrosis.

Chromidrosis.—An affection characterized by the secretion of coloured sweat. The colours most commonly seen are red and yellow. The parts most frequently affected are the face and trunk.

BOILS

A **Boil** is an acute circumscribed inflammation of a sebaceous gland or hair follicle which usually terminates in suppuration (p. 569).

Treatment.—For the relief of pain, heat may be used; fomentations of perchloride of mercury (1–4000) (p. 90), hypertonic fomentation (p. 91), or spirit compresses (p. 94). Treatment by injections of penicillin (p. 841) is the most recent and most successful. Boracic fomentations should be avoided. Should the boil proceed to suppuration, surgical treatment is given (p. 464). The general health must be attended to, and in cases in which the boil recurs, vaccine treatment (p. 837) will probably be prescribed.

CARBUNCLE

A **Carbuncle** is a circumscribed inflammation of the skin and deeper tissues, characterized by a dark-red, painful node that breaks down and discharges through several apertures.

The exciting cause is bacterial (p. 824). Predisposing causes are lowered vitality, diabetes (p. 289). The most common sites for carbuncles are the nape of the neck, the buttocks, and the back. There is generally marked constitutional disturbance.

Treatment.—Surgical treatment (p. 464) and penicillin injections (p. 841) may be given. The general health is attended to, tonics, stimulants, and good food are essential. (For further treatment see pp. 569 and 571).

Dangers.—Septicaemia (p. 575).

PEMPHIGUS

Pemphigus shows itself by the appearance of large vesicles or bullae on the skin. The eruption is often symmetrical and is ushered in with febrile symptoms, and itching and burning in the affected parts. The vesicles may attain the size of an egg, others, of course, are much smaller, and may be met with on any part of the body. In severe cases the vesicles become confluent. They are at first filled with a straw-coloured fluid, which may subsequently become purulent, but in small ones may be absorbed. The disease usually occurs in persons of lowered vitality.

Treatment.—In severe cases the tank (p. 116) may be found very valuable, the patient being kept immersed sometimes for hours. To a bath of 70 gallons one pint of peroxide of hydrogen may be added or a weak solution of permanganate of potash is often beneficial. On removal from the tank to the bed, the vesicles are dressed with some simple ointment. In less severe cases, where the blebs are small, and not extending all over the body, the following treatment is adopted. Vesicles containing serous fluid only are snipped at the edge, and the thin covering of skin is allowed to remain on. If the fluid is purulent, the entire covering is removed, leaving underneath an excoriated patch of skin, to which some simple ointment is applied. Good nourishing diet and perfect rest are essential. Arsenic may be given internally. The disease is very liable to recur on slight provocation such as bad health, mental worry, etc.

PSORIASIS

Psoriasis.—This disease is not attended with any constitutional symptoms, and is distinctly hereditary. It is most intractable to cure, and even when cured appears again and again. It generally begins on the elbows and knees, forming white scaly patches, which, in an extensive case, may be found scattered all over the body even invading the head and face. The patches are always superficial, are formed of thickened epidermis, and sometimes of a deep-red colour. They may be complicated by eczema.

Treatment.—Internal medication is prescribed, and includes thyroid extract in doses of 4 grains, or arsenic, commencing with small doses and gradually increased. Baths are sometimes used, the vapour and alkaline chiefly (p. 117). Ointments containing some stimulating application, such as chrysophanic acid, salicylic acid, or aristol, are used for clearing off the thickened epidermis; or the patches may be even blistered, with the same object, care being taken to blister only two or three patches at a time (p. 95). In applying chrysophanic acid, care must be taken to confine the ointment to the areas involved as much as possible, as otherwise it produces erythema in the surrounding skin with a good deal of constitutional disturbance. If this should occur the surrounding skin should be treated with zinc ointment.

ACNE

Acne is an inflammatory process in and around the sebaceous glands. It is usually due to some circulatory disorder, sebaceous obstruction being a secondary result. The most common forms are *acne vulgaris* and *acne rosacea.* It usually appears on the face and shoulders, the skin is of a coarse and greasy nature.

Treatment.—Is more constitutional than local; and must be directed to rectify any functional disorder; particular attention is directed to the diet and habits of the patient; careful regulation of the mode of living being more important than drugs. The patient should wear suitable clothing, such as will keep the body warm without any excess of weight, and also without causing irritation. Plenty of outdoor exercise is very essential, and a plentiful use of soap and water; hot baths and friction are of great importance; hygienic, wholesome habits and surroundings are especially necessary; at the same time patients should avoid excesses of every kind. Iron tonic, cod-liver oil, and rhubarb mixture are usually prescribed, and a sulphur ointment to be rubbed into the skin at night and washed off in the morning. Vaccine treatment proves successful in many cases.

LICHEN

Lichen.—In this disease the striking feature is inflammatory papules. There are three kinds of the disease, *lichen pilaris*, *lichen scrofulosus*, and *lichen ruber*.

Treatment.—Improving the general health by treatment of the constitutional symptoms is essential. Alkaline baths (p. 117) and the application of ointments are ordered. Rest in bed is necessary.

HERPES

Herpes is an acute inflammatory affection of the skin or mucous membrane, characterized by the development of groups of vesicles on an inflammatory base. Two kinds unconnected with each other are: (1) Herpes zoster; (2) Herpes catarrhalis.

(1) *Herpes zoster or shingles.*—In this type the lesions are distributed in relation to the course of a cutaneous nerve, and, as a rule, unilateral. They are usually seen in the line of the intercostal nerves, but may follow the course of any nerve. The outbreak of the eruption is generally preceded by severe neuralgic pain. The condition is thought to be due to a filterable virus. It is considered to be associated with chicken-pox (p. 338) although nothing definite is known of the relationship.

Symptoms.—Acute neuralgic pain and tingling over the course of the nerve affected is followed by tenderness and redness of the skin. Later crops of vesicles develop on the patches of inflamed skin and follow the course of the inflamed nerve. Still later, the vesicles dry off and separate, but the skin remains tender and painful for some time, often months.

Treatment.—Rest in bed, attention to the general health are necessary. The vesicles are kept dry with antiseptic dusting powder (starch, zinc, and boracic) and covered with warm wool and a bandage, or the eruption may be painted over with collodion. Drugs are necessary for the relief of pain and to promote sleep, aspirin and luminal are useful for this purpose. Tonics are necessary.

(2) *Herpes catarrhalis*, though unassociated with herpes zoster, is thought to be due to a filterable virus. It occurs most commonly in the spring and autumn. After pain and tingling of the skin the vesicles appear around the lips and nose, chin, and ears. It may occur at the onset of a cold, pneumonia, or bronchitis. The eruption may be prevented from reaching the stage of vesicles by dabbing the part every half-hour with either alcohol, eau de Cologne, or a mixture of tannic acid and methylated spirit. If this is not done and the vesicles form they are kept dry, zinc ointment being useful as a dressing, or penicillin cream (p. 841).

PRURITUS

Pruritus is a localized skin irritation, generally of the genitals. Medicated baths and soothing ointments may be ordered. The diet should be very plain but nourishing, nothing stimulating, such as tea and coffee, being allowed. Obstinate cases which will not yield to treatment and are causing severe constitutional disturbance owing to the incessant irritation are treated by operation, the sensory nerve supplying the affected area is divided (p. 471).

ALLERGIC CONDITIONS OF THE SKIN

Angioneurotic Oedema, or Quincke's Disease, and Urticaria, or Nettlerash.—These two diseases are now found to be two manifestations of allergy (p. 304), the same mechanism is present in each, the difference in appearance depending on the layer of skin involved.

Angioneurotic oedema tends to be a familial disease; in this the swelling is subcutaneous and the elevations are larger than in urticaria. Any part may be affected, and when the swellings take place in areas with loose subcutaneous tissues, the swelling is correspondingly larger. The eye may be completely closed during an attack. Attacks may also occur in the throat, occasionally necessitating tracheotomy. It is also common in some nervous diseases, such as disseminated sclerosis (p. 379).

Urticaria, or nettlerash, in appearance is similar to that produced by the sting of a nettle. The appearance is also similar to that produced when histamine is injected into the skin, and to that produced by the injection of a solution of a particular protein to which an allergic patient may be sensitized (p. 306). The number and position of wheals varies from time to time, but they are usually multiple.

Dermographism is a condition closely allied to urticaria in which merely stroking the skin will produce a wheal similar to a typical urticarial lesion. The condition often accompanies true urticaria, but may be present apart from other urticarial symptoms.

Causes.—Certain food idiosyncrasies are particularly prone to cause the allergic condition, strawberries, shell-fish, milk, eggs, and fish: a local application of an antigen may also cause the symptoms. External irritants: insect bites, application of iodine, picric acid, etc. Drugs: **aspirin, quinine, salicylates, sulphate of magnesia, etc.**

Mechanical stimuli: heat, cold, and sunlight. Burns (p. 521) may also be the cause, for in burns an alteration of tissue protein may ensue causing sensitization (p. 304) to such compound protein, and for the same reason large subcutaneous haemorrhage may be the cause, or the rupture of a hydatid cyst (p. 227) or deficiency of blood calcium content, or focal sepsis.

Treatment.—As in all allergic conditions, if it is possible the treatment is to avoid contact with the offending substance, or to be desensitized to the particular protein (p. 306) when any particular food or drug has been proved to be the cause. In focal sepsis the source of infection must be located and treated, teeth, tonsils, nasal sinuses, gall bladder may all be the septic focus. In cases which depend on focal sepsis, where the causative organism is known but cannot be dealt with, vaccines are of use. For blood calcium deficiency, calcium may be given by mouth, it is necessary also to give Vitamin D, otherwise the calcium may not be absorbed. Injections of parathyroid may be used but may raise the calcium content to a dangerous degree. In urticaria of alimentary origin it has been found that the administration of dextrose in large quantities is of benefit, the object being to maintain an adequate supply of glycogen in the liver. This treatment has been very successful in children. Various forms of *protein shock* have been advocated such as the injection of milk, peptone, or T.A.B. (for method see p. 306). Temporary relief from irritation may be obtained by a hot bath, or the application of cooling and evaporating lotions. The bowels should be kept freely open to assist in the elimination of toxins.

Eczema is an inflammatory disease characterized by a variety of lesions of the skin, i.e. papules, vesicles, pustules, scales, and crusts (p. 189), and associated with itching and more or less discharge. It is remarkable for its variety of conditions and method of progress. It consists essentially of the swelling of the cells of the Malpighian layer of the skin and shows itself as *weeping eczema* when serum exudes through the upper layers. In infancy, eczema tends to persist in the flexures, especially the flexor surfaces of the arms and legs. This type of eczema is often associated with asthma (p. 249) and hay fever (p. 308) and is often known as the *Besnier type.* In the areas affected there is redness and thickening, with the formation of vesicles, which rupture. Itching is intense and the resulting scratching leads to thickening of the skin, 'lichenification.' The eczema may persist throughout life, or may clear completely, with subsequent development of asthma. The Besnier type of eczema occurs in families with an allergic tendency (p. 304). Other types of eczema which are due to local acquired sensitization

(p. 305) do not show this tendency to familial incidence but depend on occupational environment. Baker's eczema and the occupational dermatoses belong to this category. *Application* dermatitis is also distinct from true allergic eczema: some people are very sensitive to external irritants such as iodine, picric acid etc. In these cases the eczema is confined to the part which comes in contact with the irritant.

Seborrhoeic eczema is another type due to the monilia group of organisms. The distribution of the lesions in this group differs from the Besnier type and occurs in areas which are in contact with the scurf from hair, or upon which scurf may fall.

In true allergic eczema changes in the blood and urine are marked. There is also increased tolerance to dextrose. In view of the marked pigmentation which occurs in this type, suprarenal deficiency is thought to be a factor. There is a tendency for allergic eczema to alternate with other allergic conditions, and it may occur for the first time when other symptoms have been relieved by desensitization (p. 307). On the other hand when eczema has been relieved, asthma may appear.

General treatment.—Some cases may be found to be due to specific sensitization to food and may be cured when desensitized (p. 306), or contact is avoided with the offending substance. In cases of eczema due to local causes such as occupational eczema, either there should be a change of occupation or contact with the antigen may be avoided by wearing rubber gloves. The following line of treatment is recommended by Barber.

(1) A diet containing little meat, fish or milk, and consisting chiefly of vegetables, fruit, and toasted wholemeal bread.

(2) A completely outdoor life.

(3) Dextrose given at bedtime and on rising.

(4) Treatment to bring about a general desensitization by autohaemotherapy, peptone, or typhoid - paratyphoid vaccine (see allergy, p. 306).

Local treatment.—The success or failure of local applications depends chiefly upon the mode of applying remedies. Ointments must never be roughly applied or rubbed on the eczematous surface, but applied carefully, spread on strips of lint, kept in place by a gauze bandage (p. 129), and changed at least every 12 hours. By this means exposure to the air is avoided; this is of great importance, as it prevents the drying of the serous fluid and the formation of scabs. When changing the dressing, the layer of ointment and all discharge must be gently and carefully cleaned off before the fresh application is put on. In the erythema form, a dusting powder, consisting of zinc, talc, and camphor, or a calamine lotion is used. In the ' weeping ' form, lotions of various kinds are used, such as an evaporating lotion of lead and spirit, lead and carbolic, or dilute liq. carbonis detergens ʒj in ʒx, or perchloride of mercury (1–5000). Care must be taken to maintain proper drainage by the frequent changing of lint and gauze, the surrounding healthy skin being protected from inoculation by a dusting powder or a thin layer of zinc paste lightly smeared on. By the frequent changing of a cooling lotion, the temperature of the inflamed part is lowered. If this is not sufficient to keep the part cool, oiled silk or gutta-percha tissue may be used to keep in the moisture; in either case the dressing must not be allowed to get dry. When the acute symptoms subside and the exudation is arrested, calamine lotion is lightly applied, care being taken to avoid caking on by absorbing any excess with a clean soft rag, which is gently dabbed over the part before the lotion dries. This will usually complete the cure. Should, however, further protection be necessary, a piece of lint spread over with a little weak mercurial ointment may be laid on over the calamine lotion and lightly bandaged on. This will have the effect of rendering the skin aseptic until the horny layer is thoroughly restored. In cases of recurring vesicular eczema, so long as the eruption is attended by severe subjective symptoms, a soothing plan such as the above must be used. When these subside, and vesiculation continues or becomes chronic, mop the part over with liq. potassae B.P., so as to break up the vesicles, every day for about a week, and then apply a weak mercurial ointment. This method is of great service in helping to eradicate the disease, causing the skin to heal from the bottom. The use of soap and water is strictly forbidden. The skin may be cleaned with a little olive oil or vaseline, and the rays of the sun or heat of the fire should be carefully avoided.

Prurigo.—A chronic inflammatory disease of the skin characterized by small pale papules and severe itching. The papules are deeply seated, and are most prominent on the extensor surfaces of the limbs. The disease is one of the skin allergies (p. 417) and is a variety of eczema in which the predominant symptom is itching rather than weeping. It is probably due to sensitization (p. 305) of the Malpighian layer, but of the deeper layer, so that oedema causes pressure on the nerve endings. The majority of the visible lesions are caused by scratching. It is especially troublesome in elderly people.

Treatment.—Desensitization (p. 306) is undertaken if the antigen can be demonstrated, but often sensitization to a number of antigens obtains and this is therefore impracticable. The treatment is that described under eczema (p. 418). Local applications of tar, sulphur, or naphthol may be applied locally or by means of vapour baths (p. 113).

CONTAGIOUS DISEASES OF THE SKIN

In these cases the patients should be treated as infectious; that is, all linen used by them should be disinfected (p. 10) before being sent to the laundry, the nurse should be careful to disinfect her hands and arms after attending to them (p. 46).

Ringworm.—This disease is caused by a parasite, the Tinea tonsurans. It is a circular skin eruption; it is contagious, and may occur on the scalp or the body.

Treatment.—Treatment by X-ray is now usually adopted for ringworm of the scalp (see p. 727). For ringworm occurring on the body, painting with iodine, or iodine ointment, may be ordered. Treatment for the scalp, when X-ray treatment is not given, consists in shaving the head and applying iodine or whatever ointment preparation is ordered. A linen cap should be worn. The brush and comb should be destroyed, also all hats worn at the time the disease was contracted. The child should not be allowed to attend school or mix with other children until cured. The general health must be attended to.

Favus is a disease closely allied to ringworm, but differs in the character of the parasite, and also in the length of time required to effect recovery, favus being much the more difficult to cure. It is a cutaneous contagious disease and occurs most commonly on the scalp. It is marked by a favose scab.

Treatment.—Treatment is by X-ray for the scalp, after cleaning off the scab as described under pediculosis (p. 419). For patches on the body, 10 per cent chrysarobin may be used. The constitutional condition of the patient is much improved by cod-liver oil and iron tonics. The brush and comb must be frequently washed in carbolic (1–20), and burnt when the disease is cured.

Lupus.—This is a tuberculous disease (p. 318) of the skin. It is generally divided into two classes, *lupus vulgaris* and *lupus erythematosus.* The first form consists of new tissues which have a tendency to ulcerate. The process is slow, usually more active in children than in adults. The normal sluggishness of the disease may be diversified by an occasional period of unusual activity, during which the disease makes great destruction. Slow ulceration takes place, the lupoid tissue breaking down and forming a granular ulcer. It is a most obstinate affection, and has a tendency to recur.

Treatment consists in the removal or destruction of the diseased tissue. X-ray and Finsen light treatment are found to be of the most use. Other treatment may consist of scraping the part under an anaesthetic and applying a caustic; this process is extremely painful for some hours after the effects of the anaesthetic have passed. The part is swabbed over with vinegar after the application of the caustic, and covered with lint spread with vaseline. In superficial cases, salicylic acid ointment is useful in bringing about exfoliation of the diseased tissue. The ointment must be confined to the diseased tissue and not touch the surrounding healthy skin. Pyrogallic or salicylic plasters are frequently ordered, great care must be taken to cut them to the exact size and shape of the affected part, and retain them in place with strapping. It is a good plan to cover the plaster over with a piece of lint spread with a non-irritating ointment. In extensive cases skin grafting will have to be employed (see p. 465). Good nourishing food, fresh air, and tonic treatment must be given.

Scabies.—A disease caused by the feeding and breeding of a minute insect, the Acarus scabiei, in the horny layers of the skin.

The *symptoms* of the disease are intolerable itching, which is worst on going to bed at night. The first sign is the cuniculus or burrow. This is seen by the naked eye as a minute, fretted line, roughened from the disturbance which it sets up in the horny layer. It varies in length, being usually a quarter of an inch long. The burrows are found chiefly between the fingers, on the fronts of the wrists and ulnar sides of the hands, the extensor surfaces of the elbow, the anterior of the axillae, the nipples in women, umbilicus, gluteal region, and feet in the same positions as the hands.

Treatment.—There are three points to be attended to in the treatment: first, the killing of the acarus and the ova; secondly, the disinfection of the clothing (p. 47); and thirdly, the subduing of the inflammatory symptoms caused by the disease and often aggravated by the treatment. To ensure the destruction of the parasite and its ova the following treatment is carried out: The patient has a hot bath, and, in the case of an adult, soft soap may be used as an inunction and then washed off in the bath, the hands and feet being scrubbed with a nail brush. The application is then rubbed in and the night clothes put on; in addition, cotton gloves and socks may be worn. Next day no washing other than that of the hands and face is allowed, but a second inunction of the ointment is practised. The third day is the same as the second. On the fourth morning a hot bath is taken to remove the ointment, and the patient is kept under observation for ten days to see that there is no recurrence. Clean clothing is worn and the bed linen and blankets, etc., are changed.

In the case of young children and patients with delicate skins the soft soap may be omitted, ordinary toilet soap or sulphur soap being used. It is advisable for the patient to wear the same clothing until the completion of the treatment, to ensure its complete disinfection. The drug most commonly used is sulphur in the form of ointment. If the irritation continues after the destruction of the parasites and the ova, a soothing lotion or ointment is prescribed and used until the dermatitis caused by the parasiticide treatment has subsided.

Impetigo contagiosa.—A cutaneous pustular disease of an infectious nature often found in schools. It consists of vesicles (p. 189) which appear here and there, on the face particularly, and dry up, leaving thick brown scabs the discharge from which is infectious. These scabs fall off, leaving scars, but the disease spreads from place to place over the skin, and may last for months if untreated. The eruption quickly disappears as a rule when treated.

Treatment.—The scabs are softened by the application of starch poultices (p. 92). When soft they are removed by swabbing with a mild antiseptic lotion. Dilute ointment of ammoniated mercury (white precipitate ointment) is then applied. The treatment is carried out twice a day until the skin has healed. A liberal diet is given and plenty of fresh air is essential. A daily hot bath should be taken. The clothing worn next to the skin should be disinfected before being sent to the laundry.

PARASITES (EXTERNAL)

PEDICULOSIS (INFECTION WITH LICE)

Three forms of pediculosis affect the skin, namely: (1) *Pediculosis capitis*, (2) *Pediculosis corporis*, and (3) *Pediculosis pubis*.

1. **Pediculosis Capitis.**—The Pediculus capitis (head louse) is by far the commonest variety in England. The disease is very contagious, for the parasite will live some days, at all events, when separated from its host, and, moreover, wanders about the surface of the head. Consequently, it may drop off on to another individual if the infected person lean over him, or it may be left behind in the headgear, or on chair backs, cushions, etc. The parasite is about four millimetres in length when full grown, and appears among the hairs as a greyish-yellow body. The eggs or 'nits' are greyish-white conical bodies, and may be easily mistaken for pieces of scurf,

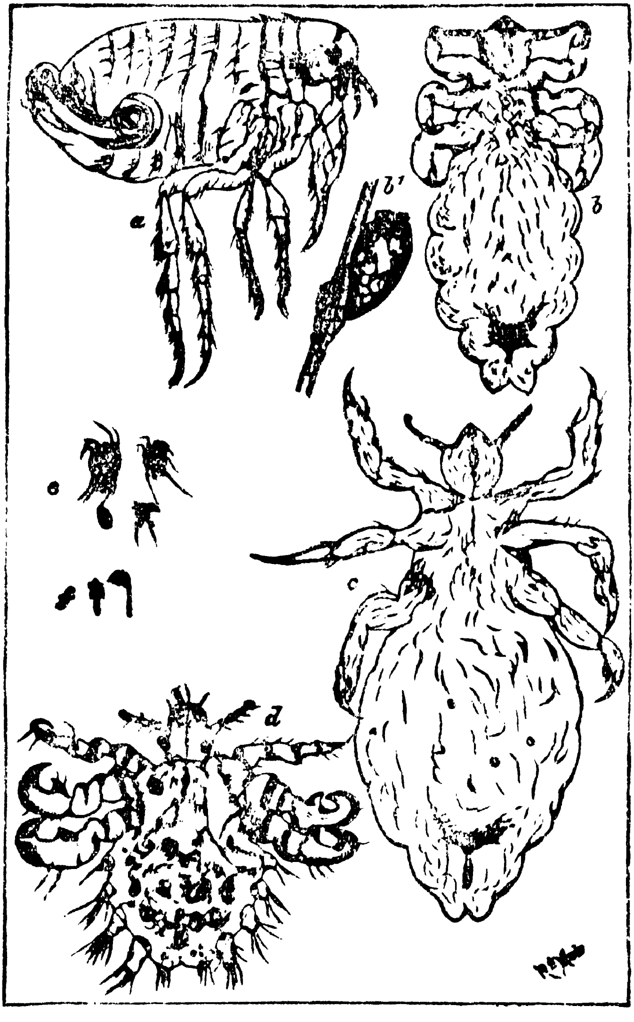

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FIG. 182. FLEAS AND LICE (×17 DIAM.)

(*a*) Flea.	(*e*) Acarus scabiei (itch mite) (female, male, ovum, larva).
(*b*) Pediculus capitis (head louse).	(*f*) Demodex folliculorum (a parasite which lives in sebaceous matter and 'is of no pathological importance').
(*b*¹) Ovum of ditto with embryo ('nit').	
(*c*) Pediculus corporis (body louse).	
(*d*) Pediculus pubis (pubic louse).	

though on close examination they have a more regular outline and a polished appearance. They are glued to the hair by means of a complete sheath of cement surrounding it.

The first symptom is itching. It should be remembered that the parasites in cleanly people in small numbers may be easily overlooked, and an ill-defined, pruritic, papular (p. 189) rash on the nape of the neck should always give rise to strong suspicions of pediculosis capitis. In all cases of adenitis of the neck examination should be made, remembering that, in mild cases, the most favoured sites are the nape of the neck and the hair immediately above the ears. In severe neglected cases, the disease causes a great disturbance in the skin of the head, producing pustular eczema, adenitis, even abscesses in the glands at the back of the neck and beneath the lower jaw. The nits are frequently seen clinging to the hair, with lice burrowing among the eczematous sores, and in still more severe cases the scalp is often covered with a thick yellow incrustation matting the hair in an inextricable tangle.

Treatment.—Many methods have been recommended and employed, but the following is the most modern. It is unnecessary to cut the hair. The patient, unless of extremely tender age (any age over three years is great enough), should lie on her back on the bed with her head projecting beyond the mattress over a basin (see hair washing, p. 14, Fig. 2).

Tar Oil Compound.

5% wood tar oil
1% lemonglass oil (scent)
74% paraffin oil
20% cotton seed oil

Borax Shampoo.
To wash hair and loosen nits.

2 oz. borax powder
2 lb. soft soap
1 gallon water

First rub tar oil compound on scalp. Wait five minutes; comb out, using a Sacker's nit-comb, over a basin. Then wash well with borax shampoo and wait again for five minutes; then comb off all nits and rinse the head. Dry the hair.

An alternative method is as follows: A sufficiency of 1–40 carbolic acid solution is poured over the head from the front into the basin in which the hair may lie. The solution is then emptied back into the bowl, and poured over again and again until it is quite certain that the hair is all saturated. The hair is then lightly squeezed out, and the whole head is covered with a compress, using lint wrung out of the carbolic (1–40) solution, over which a piece of jaconet is placed and retained in position with a three-cornered handkerchief (p. 140). Care must be taken to see that the compress covers all the hair but that it does not touch the skin of the forehead or the neck, or a burn may result. The compress is left on for from one hour for a small child, to four hours in the case of an adult with thick hair. At the end of this time, the head is washed with soft soap, and the crusts, which will be found to be entirely softened and loosened, removed, the raw places being dressed with white precipitate ointment (10 grains to the ounce). The nits are not removed, but the embryos are killed by the penetration of carbolic acid. For removal of the nits, the tar oil compound method as described above or acetic acid using a fine horn tooth-comb is efficient. A sassafras or soap liniment compress may be substituted for the carbolic one if desired. The objection to sassafras is its odour. The advantage of soap liniment is that the head may more easily be washed subsequently.

In the most severe cases it may be found necessary to shave the hair when the scabs have been removed, as the hair cannot be unmatted. The hair should be carefully combed twice a day subsequently with a fine tooth comb and carbolic lotion (1–20) for a week or ten days. Hat linings should be renewed or the hats sterilized by stoving, brushes may be soaked in carbolic lotion (1–20) for half an hour, after which they must be washed. Care must be taken to prevent the back of the brush soaking in the lotion or it will be spoilt. Combs should soak in the same way and then undergo a thorough cleaning. If it is found that after the first compress all the nits have not been destroyed it may be repeated a second time.

2. Pediculosis Corporis.—The Pediculus corporis (body louse), unlike the Pediculus capitis, is seldom found on young subjects. It may affect adults of any age, but is most commonly found in elderly people, especially those who are in a condition of senile cachexia (p. 188). The louse itself wanders over the body, and sucks blood from the skin by protruding a small proboscis. It is not often found on the skin when the clothes are removed, since it generally adheres to the clothing. The best place to search for it is towards the neck of the garment, especially if it be of woollen material, and it may usually be found hiding under the crevice formed by the hems. It is of a greyish colour. The nits are laid on the hair of the clothing and occasionally on the hair of the body.

The symptoms are a general itching of the body, the site of greatest intensity being generally the shoulders.

Treatment.—A hot bath with plenty of soap and water, followed by the inunction of the ordinary white precipitate or sulphur ointment. It is extremely important that the clothes which have been worn during the day and the night, and the bedclothes, be disinfected (p. 46), as the nits are chiefly laid on these.

3. **Pediculosis Pubis.**—This is a much rarer disease than either of the two former varieties, and is most often transmitted venereally. The Pediculus pubis (pubic louse) is of a distinctive shape. Its body is broad and short, in fact almost circular in shape. To the naked eye it appears as a darkish-grey speck, and may easily be mistaken for a piece of fluff left from a woollen garment. It lies almost invariably at the root of the hair. The nits are laid on the pubic hairs, and are of a dark colour. The parasite also occasionally attacks the eyelashes (pediculosis ciliorum), and in still rarer instances the axillary hairs.

The symptoms are intolerable itching of the affected part. As has already been stated, the disease is most often acquired venereally, but it may also be caught by the use of dirty closets after an infected patient has been sitting there.

Treatment.—A daily hot bath, with the use of a plentiful supply of soap and water, followed by inunction of sulphur ointment, or mercurial ointment (30 per cent mercury), is necessary. For those cases in which the eyelids are affected a weak ointment of mercuric nitrate may be used, and the insects should be picked off the lashes with forceps, or the lashes may be cut off (p. 636), daily examination being carried out for about a fortnight.

Fleas, Bugs, and Harvest-Bugs

These are all very common parasites which infest the skin. The two former need no description, the treatment necessary for their removal is hot baths with a liberal use of soap, and the disinfection of the bed and body linen (p. 47).

The Harvest-Bug is a minute spider of a bright red colour. It is commonly contracted when walking or sitting on grass during the months of August and September.

The best treatment is the prevention of infection, which may be brought about by anointing the skin with lavender oil, sulphur ointment, or eucalyptus oil before going out; the parasite will then not attack the anointed parts. The most effectual after-treatment consists in dabbing the inflamed areas with ammonia; this will allay the irritation.

D.D.T. (Dichlordiphenyltrichlorethane).—A powder which when applied as described on p. 841 will kill fleas, lice, bugs, mosquitoes, flies, as well as other insects, thus preventing the contraction of diseases caused through parasitic infection (p. 316).

CHAPTER XII

SURGICAL NURSING

General Technique.—Before undertaking surgical work, the nurse must thoroughly understand and bear in mind the meaning of the three following terms, on which the whole theory of successful surgery is based.

1. *Sepsis.*—A condition due to infection with pyogenic bacteria.
2. *Asepsis.*—A sterile condition, or one free from bacterial infection.
3. *Antisepsis.*—The exclusion of pyogenic bacteria, brought about by the use of heat and chemical agents.

A wound cannot heal by 'first intention' when septic; therefore, the main point for the nurse to remember is, that the wound must be kept free from infection and subsequent sepsis in order to promote healing by 'primary union.'

The Healing of Wounds (p. 517).—When the edges of a wound are brought into apposition, and the other necessary factors for healing to take place have been attended to (p. 517), and healing takes place rapidly without suppuration or granulation, and with but little inflammation, the wound is said to heal by 'first intention' or 'primary union' and very little scar results. Wounds heal by 'second intention' or granulation when their edges are separated. This may be brought about by infection causing the wound to suppurate, and wounds in which there is loss of substance must heal by granulation or second intention, and a large scar results. Healing is also a much more lengthy process and often accompanied by severe pain and general disturbance to the health. To obtain healing by 'first intention' it is necessary, both during the operation and subsequent dressings, and until the wound has healed, to make use of one of the following methods: (1) Antiseptic method. (2) Aseptic method. (3) A combination of the two previous methods.

1. *The antiseptic method.*—The antiseptic plan of treating wounds, as originally introduced by Lord Lister, is an outcome of the germ theory of infection (p. 833). It has for its object the prevention of bacterial development in wounds by the use of chemical agents, some of which are true germicides, capable of destroying bacteria, whilst others merely prevent or inhibit their growth.

2. *The aseptic method.*—In this method all chemical antiseptics are eliminated, and heat, either dry or moist, is the sterilizing agent employed. Heat, in the form of either boiling water or

steam under pressure, is one of the most efficient germicides, provided that it is maintained for a sufficient length of time (see sterilization, p. 40). It is of course possible to render most of the things that will come into contact with the wound sterile by heat, but it is impossible to render the air, or the skin of the patient, surgeon, and assistants, sterile in this way, hence a certain amount of risk is run, and for this reason a third method has come into use. It is a combination of these two methods and is the one almost universally used at the present time.

3. *The combined method.*—The exact amount of the combination of the aseptic and antiseptic methods, together with use of antiseptics, or not, for the dressings and lotions, varies with each particular surgeon; therefore, it is always well to make sure beforehand what the surgeon prefers in these matters. Methods of sterilizing with either dry or moist heat, and also by the use of antiseptics, will be found in Chapter II. See also p. 838.

Instruments are boiled (p. 43), then may be placed dry on a sterilized towel, or immersed in sterilized water or an antiseptic lotion.

Bowls, porringers, etc., are sterilized by boiling or immersion in carbolic (1–20) (p. 42), or when needed in a hurry, by flaming (p. 42)

Swabs, towels, overalls, masks, etc., are usually sterilized by the dry method and used dry, with the exception of the swabs, which may be used wrung out of a warm antiseptic solution or warm normal saline.

Antiseptic lotion will be required for the purification of the patient's skin (p. 437), also for the hands and arms of the surgeon, his assistants, and the nurses (p. 431). Should irrigation of the wound be necessary, saline solution will probably be required for this purpose, except in the case of a septic wound which may require an antiseptic solution for irrigation.

Rubber gloves, after sterilization (p. 42), may be put on dry, or filled with an antiseptic solution.

The *dressing* will consist of either plain or medicated gauze, and wool, prepared by dry sterilization, or again the gauze may be wrung out of a warm antiseptic before being applied.

The *theatre dress* consists of overalls, overshoes, caps, and masks, all of which, with the exception of the shoes, are sterilized by the dry method. The shoes are washed over with carbolic (1–20), or canvas boots which may be sterilized are worn. The nurse must be careful when putting on her sterilized cap to cover her hair entirely, bringing the cap low down across the brow and fastening it at the nape of the neck.

The overalls may be made with either long sleeves or elbow sleeves according to the preference of the surgeon. When long sleeves are worn the cuffs of the sterilized gloves are brought over the wristbands. When elbow sleeves are in use the cuffs of the gloves are drawn up the arm as far as possible. In this case the arms as well as the hands will require to be re-purified as often as necessary. (For further particulars of the nurse's dress see p. 3.) In hospital it is usual to arrange for one nurse to be dressed and prepared as described, and to remain sterile; that is, she has nothing to do with anything that has not been rendered sterile. The second nurse is dressed in the same way, with the exception that gloves are not worn and an elbow sleeve overall is the more convenient for her. She has to do with the preparation of lotions, etc., emptying basins and generally preparing things; she is not to touch anything sterile without forceps, etc., unless she has thoroughly purified her hands and arms.

SURGICAL TECHNIQUE

The following points must be borne in mind by nurses during the operation or the dressing of a wound, and apply equally whichever method is in use.

No sterilized article must be allowed to come in contact with anything that is not sterile; for instance, a sterilized bowl may not be placed on a table unless the table has been previously rendered sterile. Hands and arms must always be purified before putting on sterilized gloves; it is as necessary to cleanse the hands when wearing gloves as if they were not to be worn. To prevent 'droplet' infection a sterile mask is worn.

If, during an operation or dressing, an instrument which has not been previously sterilized is required, or one has become soiled by falling on the floor, it may be quickly sterilized by immersing it for half a minute in pure carbolic acid, the excess of which is removed by washing it thoroughly in hot sterile water or alcohol. Should pure carbolic not be at hand, the instrument, after being washed, must be boiled for ten minutes; dipping it in the sterilizer is absolutely useless and unjustifiable. The instrument must be picked up from the floor by someone not assisting at the actual operation or dressing, and who is not handling sterile articles.

A nurse must be thoroughly conscientious about maintaining the asepsis of all appurtenances required for the operation, and for the dressing, including her hands (p. 46). Any slackness in this particular may cost the patient his limb or his life, and nurses entrusted with the preparation of articles required should bear this constantly in mind. Any septic abrasion (p. 519) on the hands should be reported immediately, and, until it has healed, the nurse should on no account assist at an operation or dressing without the surgeon's consent, even though she covers the wound with a dressing and wears gloves. It must be borne in mind that dry sterilized articles do not remain sterile when exposed to the air; they must, therefore, be covered when possible, otherwise they must be changed frequently. For instance, the dry sterilized towels require to be changed once or twice during an operation if it is of long duration.

Nurses must avoid touching their overalls when the hands have been purified, as the overall is no longer sterile after it has been on for a short time. It is a great fallacy to suppose that a dry sterilized overall or cap will remain sterile indefinitely.

To purify the Hands before attending Operations, Dressings, etc.—Turn up the sleeves above the elbows. Trim the nails short and clean them. Wash and scrub the hands and arms to above the elbows with ether soap and hot water; running water should be used, otherwise the water must be changed once at least. Continue the washing for five minutes, then rinse in clean water. Immerse the hands and arms in a solution of biniodide of mercury in spirit (1–500), and scrub them with the lotion and a sterilized nail brush or gauze swab. Next immerse them in perchloride of mercury (1–2000). Sterilized gloves may then be put on out of the perchloride lotion (p. 41), or the hands may be dried on a sterile towel and dry sterile gloves put on, using sterile powder.

SURGICAL NURSING

Preparation of the Room for an Operation.—Slight operations, or those of minor importance, may be performed whilst the patient remains in bed. Some ophthalmic surgeons prefer to operate with the patient in bed to prevent subsequent movement. The preparation of the room and the appliances needed are much the same as for major operations, except that fewer things are required. In the case of major operations the nurse is usually sent for a day or two before the operation is to take place, so as to have time to prepare the patient and the room. (For the care of the sick-room see Chapter I, p. 4.) If an immediate operation is to be undertaken, the great point is to disturb the room as little as possible, so that the dust is not stirred up and left floating about the room (p. 8). If the floor is carpeted, the carpet is covered in the area of operation with a clean dust-sheet carefully laid and pinned down, or a large piece of linoleum or clean drugget may be used, failing these, large pieces of new brown paper will do. (For the appliances, etc., required see p. 432.)

To prepare the Room when the Operation is not Immediate.—The day before the operation is to take place, the room must undergo a thorough cleansing. The chimney should be swept unless it has been recently done; the walls rubbed down with dough, the paint washed, and the windows cleaned. The blinds are washed, if venetian, otherwise they need to be brushed and dusted with a damp cloth. The carpet is removed and the floor scrubbed; if linoleum is laid it should be washed over. Pictures require cleaning back and front; it is better not to re-hang them until after the operation, if, as is usually the case, the operation-room is subsequently to be used as the sick-room. Unnecessary furniture is removed to make room for the extra tables that will be required for the operation. Everything remaining in the room is well cleaned, shades over the lights being washed.

The best plan is to arrange that the patient occupies another room until the day of operation, only coming to the operating-room when the surgeons are ready. Of course if it is possible to have two suitable rooms, the operating-room may be used for that purpose alone, the patient being carried back to the sick-room after the operation; in this case the operating-room should have nothing in it but that furniture which is required for the operation. If only one room is available, and the patient cannot be removed, screens should be arranged round the bed so that the preparations are not seen. It is convenient sometimes to use a dressing-room adjoining the large room for getting things ready. Having thus prepared the room, clean washing curtains may be put up, a short thin muslin blind being fixed across the window, if it is one that can be overlooked.

A suitable 'operation bed' requires to be made up in readiness (page 24) to which the patient can be carried when the operation is over. On the morning of the operation, if a gas or electric heater is not available, a fire is lighted, then extinguished before anaesthetics are used. The temperature of the room should be 70° to 75° F., unless otherwise ordered. Some surgeons send their own operating-table and outfit; in other cases when time, money, and opportunity permit, the whole operating-outfit may be hired from an instrument firm. If neither of these means is available the nurse will need to prepare the necessary things.

The following is a list of the articles that will be required; modification will be necessary to suit each particular case. The disposition of the tables, etc., must be according to the wishes of the surgeon who is to operate. All the undermentioned articles need to undergo a thorough cleansing before being brought into the room.

1. A strong table for the patient, not too wide. A narrow kitchen table, or two dressing-tables of the same height, firmly tied

together end to end. Two clean blankets, folded to the size of the table, and covered with a mackintosh sheet. This sheet should be large enough to cover completely that part of the table which is liable to become soiled during the operation, and must be fastened securely underneath by tape or safety-pins. One or two horsehair pillows encased in mackintosh covers, under the clean linen slips.

2. Four tables. One to be used exclusively for the surgeon's instruments. One for the anaesthetist, with two soft face towels, a small porringer or bottom of a soap dish in case the patient should vomit. In addition the articles mentioned under anaesthetic requisites (p. 452). The third table is required for the porringers, basins, etc., used for swabs and lotions, and also the necessary things for the purification of the patient's skin (p. 437). The fourth table is used for the dressings.

3. If porringers and receivers cannot be had, the nurse should collect half a dozen suitable basins and pie dishes. Glass dishes may be used for the instruments. (For sterilization of same see p. 42.)

4. Two or three pails, or a bath, into which to empty water.

5. A kettle of boiling water, in addition to the supply of hot and cold water provided for lotions, dressings, irrigation, etc.

6. Plenty of towels. Two new cakes of soap. Three new nail brushes previously sterilized (p. 45) and placed in a bowl containing biniodide of mercury (1–1000). Two of these will be required by the surgeons, the other is used for the purification of the patient if required.

7. A large washstand with two basins, nail brushes already mentioned, soap, nail scissors and nail cleaner; jugs of hot and cold water.

8. On a small table near the washstand, a washing basin containing the warm antiseptic solution preferred by the surgeon for his hands. Two pairs of rubber gloves of the correct sizes, sterilized (p. 42) and placed in either warm antiseptic lotion or warm sterilized water, or dry, in sterile envelope. A small bottle of sterilized glycerine (p. 45).

9. Four mackintoshes of jaconet or batiste.

10. Lotion preferred by the surgeon, should be prepared to the required strength, and kept in covered labelled jugs at the correct temperature.

11. Twelve sterilized towels (p. 40). Sponges or swabs previously prepared, also abdominal cloths, if necessary, unless the surgeon brings his own. All swabs, sponges, and abdominal cloths must be counted, checked, and the number recorded in all abdominal operations. (For the preparation of swabs, etc., see p. 41.)

12. A supply of water recently boiled and allowed to cool in a covered sterilized vessel.

13. A glass flask containing saline solution made in the proportion of ʒj–℥j, it is then easy to make up the standard solution from the stock in the flask by taking ℥j of the stock solution and making it up to Oj with the addition of either hot or cold boiled water as required. The stock solution must be boiled and kept corked with dry sterile wool.

14. Dressings prepared according to the surgeon's instructions. (For preparation of dressings see p. 40.) Bandages (p. 129), safety-pins. Splints, fracture boards, cradle, or other appliances if required.

15. Foot warmers should be filled and kept hot and easily accessible. A hot bottle must never be used without a well-fitting cover, and in no circumstances should it be placed in contact with an unconscious patient, as, for instance, during or after an anaesthetic (p. 453).

The instruments are provided by the operator, sterilized (unless brought already sterilized) and put, according to his special directions, in the antiseptic solution he prefers. If a sterilizer is not procurable, a small fish kettle must be in readiness, it should be three-quarters full of boiling water to which a small lump of washing soda has been added. The nurse should arrange that it is kept boiling, either on the fire or on a gas stove near at hand.

All bowls, basins, etc., to be used for the operation should previously be washed and scrubbed with soap, then sterilized, either by boiling or by soaking in a solution of carbolic (1–20) until just before the operation.

Half an hour before the operation is to take place, the nurse, having cleansed and sterilized her hands (p. 431), must spread a sterilized towel on each table to be used for instruments, bowls, etc., and place thereon, in their respective places, the sterilized basins, etc., and leave them covered with a sterilized towel until the operation is about to begin.

In addition to the lotion prepared it is necessary to have a supply of stock lotion, so that more can be easily and quickly made with the supply of hot and cold water, should the supply run short.

During the operation the nurse should arrange that some reliable person remains outside the door, to be in readiness to fetch anything that may be wanted.

Operations are usually performed during daylight, if possible; the light from the window is usually sufficient, but it is always advisable to be provided with a suitable light as well. An electric torch or a hand lamp is very useful; failing these, a well-trimmed paraffin lamp. If the operation is taking place at a time when artificial light is necessary, the nurse must see that the bulbs are new and strong, if electric light is in use. In the case of gas, the burners, whether incandescent or not, require to be in good working order. If neither is available, well-trimmed lamps should be provided.

After the operation is over, the patient is lifted on to the bed and suitably covered, hot-water bottles having been placed in it previously so that it is warm (p. 24).

A screen is then placed round the bed, so that if the patient wakes before all the clearing up is done, he cannot see anything of it.

As soon as the patient can safely be left, the nurse should get the room straight and tidy as quickly as possible. The sick-room is not to be left by the nurse until the patient has quite recovered from the anaesthetic (p. 453).

All the clearing up in the room can be done, and other things such as dirty water, etc., may be put outside the door and emptied by someone helping. The crockery and mackintoshes should be removed to the bathroom and put to soak, and as soon as the nurse can safely leave the patient, they need to be thoroughly washed and disinfected.

Soiled dressings, swabs, etc., or any growth that has been removed and is not required by the doctor, must be wrapped in paper and put at the back of the kitchen range to burn; there should be a good fire at the time and the stove kept shut, a time when the kitchen is not being used for cooking purposes being chosen.

Bowls, basins, etc., and dressings that will be required at subsequent dressings may be kept in a separate cupboard or drawer previously disinfected by scrubbing out with carbolic (1–20).

The Preparation of the Patient.—The immediate preparation necessary before the administration of a general anaesthetic or for a minor operation is here given. The preparatory and immediate preparation required in major and special operation cases will be found under their respective headings.

Preparation for an operation to take place at 2 p.m.:

Previous day.—Bath a.m. Ol. ricini ℥j, if an adult. Light diet, fish, pudding, etc. Glucose drinks.

Day of operation.—*7 a.m.* Simple enema if ordered.

8 *a.m.* Breakfast. Tea, sugar, toast and butter, or bread and butter.

9 *a.m.* Hot bath. Should shaving of the axilla, genitals, or other hairy parts be necessary, it is performed prior to the bath given previous day. (For shaving see p. 438)

10 *a.m.* Purification (p. 437).

11 *a.m.* Cup of bovril, or cup of tea, or glucose drink.

12.50 *p.m.* Dressed in operation clothes. Bladder is emptied.

1 *p.m.* If ordered, the hypodermic basal narcotic (p. 450) injection is given. The patient is then settled comfortably to sleep. In a ward the bed is screened.

A specimen of urine is prepared and tested during the previous day, and again on the day of operation, the result being recorded on the notes or the chart. The doctor examines the patient's chest either on the previous day or the day of operation.

In urgent cases requiring immediate operation the stomach is washed out (p. 64) if it is inadvisable for the patient to wait and if food has been taken within three hours. In cases of injury to the stomach or perforation of the stomach, lavage cannot be given, but the patient usually empties the stomach by vomiting. An enema is usually administered if the case is not an abdominal one, and when there is sufficient time before the operation is to take place. A specimen of urine must be procured and tested in every case however urgent, a catheter being passed if necessary. (For the after-nursing of operation cases see p. 461.)

Patient's Operation Outfit.—It is the nurse's duty to see that the patient is prepared as follows, this preparation taking place one hour prior to the operation or anaesthetic. The following must be removed if present: Artificial teeth, artificial eyes, artificial limbs, belts, trusses, false hair, hair-pins, jewellery, with the exception of a wedding ring.

In women with long hair, the hair is plaited in two plaits and tied at the ends, except in cases of operation on the ear or neck when it needs to be plaited on the top of the head and away from the side to be operated on and covered with a sterile linen cap or triangular bandage. The patient should be clad in a warm clean flannel or cambric garment, open at the back, which is easily removable, the legs being covered in woollen stockings, reaching well up the thighs. A perineal slip (p. 148) is worn by women. A gamgee jacket (Fig. 99) is used when extra warmth is needful.

When on the theatre trolley the patient is covered with several clean warm blankets: the gown is unfastened at the neck. When transferred to the operating table a sterile bath sheet or blanket is required. The bandage retaining the purification dressing should not be severed until the patient is completely unconscious, this for two reasons: if cut before the restless period is past the dressing will fall off, and if removed when the patient is still partly conscious he will be alarmed and think the operation is about to take place before he is unconscious. In cases where the bandage is around the neck or chest, it will be necessary to sever enough of it to ensure there being no restriction to the respiration, but not to remove it completely.

Dressings.—*Purification or pre-operative dressing.*—The preparation of the skin in and around the area to be operated on is generally performed by the nurse, and may take place the night before if it is to be a morning operation, or on the same morning or at both times if the operation is to take place in the afternoon. In some cases the purification is done daily for a day or two preceding the operation. The following are some of the most usual methods:

(1) Shave the area to be operated on, that is, all the skin that will be exposed during the operation. Next wash the part thoroughly with ether soap or soft soap. Wash off the soap with clean hot water, then with sterile wool swab, rub the skin with warm carbolic lotion (1–20), and finally with hot perchloride of mercury (1–2000), and apply an antiseptic compress. The compress consists of gauze, lint, or a sterilized towel, according to the size of the area to be covered, wrung out of perchloride of mercury (1–2000) or spirit and kept in position by the application of a firm bandage. Some surgeons like a piece of jaconet placed over the compress before the bandage. If the hand or foot is to be purified, a soft nail brush should be used when washing the skin to ensure it being clean, the nails must receive special attention. Acetone, benzoin, or turpentine may be used instead of ether soap.

(2) Shave, then wash with ether soap, rinse with clean water. Next wash over with methylated ether, and finally with perchloride of mercury (1–2000) and apply a perchloride (1–2000) compress, or with surgical spirit and apply a spirit compress (p. 91).

(3) *Iodine, sterile picric acid, spirit, or aniline dyes method.*—Shave, then thoroughly wash the skin with ether soap. Rinse off the soap with clean water, then dry with a towel. Remove grease from the skin by rubbing it with a sterile wool swab soaked in methylated ether, then swab over with methylated spirit to dry the skin. When thoroughly dry, apply with a swab held in forceps the antiseptic chosen and cover with a sterile towel bandaged in position. If the operation is to take place early in the morning the preparation takes place the evening before. Two hours before the operation, the prepared area is repainted and covered with another sterile towel. The essential thing when using iodine as a purification is that the skin to which it is applied must be absolutely dry; in casualty work it may therefore be applied to a dirty skin without washing. Care must be taken to use iodine prepared with rectified spirit or water, not methylated spirit, otherwise intense lachrymation may be caused which will completely disable the operator for a short time. This method sometimes causes irritation

and soreness of the skin in young children and patients having a delicate skin, it is therefore not advisable to use it in these cases. When preparing skin for grafting (p. 465), antiseptics are not used, saline solution or soap and water is used for cleansing, followed by a saline or spirit compress. Acute urgent cases may have no skin preparation until in the theatre.

Shaving.—The points to remember in shaving are, first of all, to have a very sharp razor—a blunt razor is much more liable to cut the patient; secondly, to well lather the part for some time, using hot water and soft soap; and, thirdly, to dip the razor momentarily into boiling water before using it. When the shaving is finished, any excess of soap and loose hairs is removed with swabs, after which the patient has her bath. A safety razor is undoubtedly the best to use, otherwise a small razor should be chosen, the smaller the better.

Caution is needed as regards shaving, which should not be done unnecessarily. The eyebrows or head should never be shaved without distinct orders. A razor should not be used on a woman's face, neck, chest, or forearm without orders.

General observations.—With all the above-mentioned methods of pre-operative dressing the process is repeated at the time of operation. Any part where dirt may accumulate needs scrupulous attention, such as the umbilicus, the external ear, the fingers, toes, and nails. Care must be taken that the patient does not lie in a pool of antiseptic lotion that has run down, or a burn may result.

When using a strong antiseptic, such as carbolic (1–20), biniodide of mercury (1–500), it is necessary to wash the skin over with a weaker solution, either carbolic (1–40) or perchloride of mercury (1–2000), before applying the compress.

After-dressings.—After-dressings must be conducted with the same precautions as to face mask, asepsis of hands, instruments, etc., as the original operation, as it is quite possible to infect a wound at the dressing. It is essential that everything likely to be required should be in readiness before the dressings are removed, so that exposure to the air may last as short a time as possible.

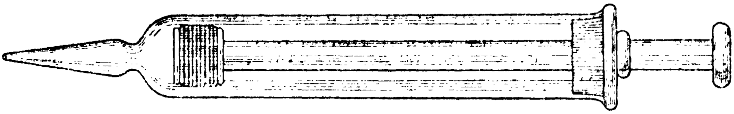


FIG. 183. Wound syringe.

Requisites.—Dressing-table on which the following sterilized articles should be placed: Mackintosh on rail, bowl of warm antiseptic lotion, perchloride of mercury (1–2000) for the swabs, bowl of antiseptic solution for the hands, instruments sterilized (p. 43) and placed in spirit. The instruments needed are scissors, dissecting or dressing forceps, two pairs, probe, sinus forceps; syringe (Fig. 183), which may be placed in the instrument bowl; three-cornered receiver or kidney-shaped tray; dressing drum containing sterilized towels, swabs, gauze, wool, bandages, pins, soiled dressing receiver, Cheatle's forceps (Fig. 184) standing in upright glass containing either carbolic (1–20) or methylated spirit.

Method.—If the surgeon is to dress the wound, the nurse removes the bandage carefully, not allowing the dressing to slip at all, and arranges the mackintoshes in position. She then removes the wool with forceps, and hands the sterile towels to the surgeon or dresser, who places them in position and proceeds with the dressing. The nurse opens dressing drums, bottles, etc., as required, and hands all sterile articles with sterilized long forceps (Fig. 184).

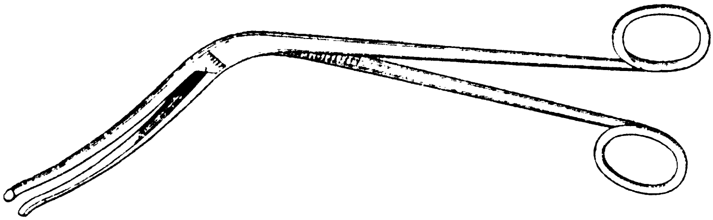


FIG. 184. Cheatle's sterilizer forceps.

Should the nurse be doing the dressing without help, she should previously so arrange that she can get at what is needed without touching lids, etc., which will render her hands 'surgically unclean.' This can be done by covering the fastenings of tins, etc., with a sterile swab wrung out of carbolic (1–20), and in other cases by the use of forceps. After removing the bandage and arranging the mackintoshes, she must re-purify her hands. The wool is next removed, using forceps, and the sterile towels are placed around. The dressing is then proceeded with, and after applying the required treatment the wound is covered with a clean dressing.

The Open Method of treating Operation Wounds.—A few surgeons use no dressings on the wound after the operation, provided it is one in which no tube or other form of drainage has been employed. The wound is carefully dried when stitched, it is then painted over with iodine solution 2 per cent; a sterile towel is sometimes placed over the wound for the first 24 hours, then discarded. The wound is painted daily with the iodine, no other treatment being used. In the case of children it is necessary to adopt some means to keep their fingers from picking the wound.

General Rules to be observed when dressing a Wound.—The soiled *dressing must not be removed until the clean one is quite ready. If for any reason there is a delay after removal of the dressing, the wound is covered with a sterile swab. Never leave the wound uncovered for one moment unless applying treatment* (this does not apply to wounds treated by the open method). When cleansing a wound, swab away from the wound and not towards it. Any discharge present needs to be carefully and thoroughly removed, but it must be done as quickly as possible. The most efficient dresser is the one who can cleanse and apply the necessary treatment in the shortest time; on the other hand, it is of no use to apply clean dressings without having properly cleansed the wound and the surrounding skin from any discharge that may be present. In applying a dressing sufficient gauze is used to ensure the wound and a wide margin around it being covered, the thickness will depend on whether there is likely to be any exudation or discharge. The gauze is then covered with wool of sufficient size to extend beyond the gauze for about two or three inches; over this a bandage is applied firmly and evenly, entirely enclosing the dressing.

The Use of Drainage Tubes.—Drainage tubes are placed in wounds at the time of operation when there is likely to be much exudation of serum, blood, or pus. They are inserted into the cavity, then cut level with the edge of the wound and retained in position by means of a stitch taken through the tube on either side and fixed to the skin. As a rule a dressing is done on the second day after the operation when a tube has been used. The tube is then either removed altogether, or in other cases it is removed for cleansing and sterilizing, then reinserted with a sterilized safety-pin through the outer edge to prevent it getting lost inside the wound. Drainage tubes are nicked out at the end and also at intervals in their length to enable the exudation to have a free outlet. When large tubes have been inserted, as in some abdominal conditions, the tubes are not removed on the second day, they are cleansed by drawing up any fluid contained in them with a sterile glass syringe. When a glass drainage tube (Keith's, Fig. 185) has been used, the end is left protruding through the dressing and covered with a second separate dressing; in these cases the nurse may be required to cleanse the tube by sucking up the fluid with a sterile syringe every four hours. Drainage tubes should not be replaced in wounds without having first been washed, syringed through to cleanse the interior, and boiled for ten minutes. In cases where the tube remains in for some time and is removed daily, it is well to have a second tube of the same size and length ready sterilized, the soiled one being cleansed and sterilized for the following dressing. Corrugated sheet rubber tubing may take the place of a circular drainage tube, or a gauze drain may be inserted.

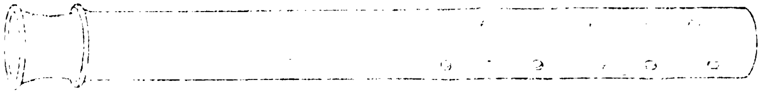


FIG. 185. Keith's glass drainage tube.

Gauze is arranged around the safety-pin over the edge of the wound to prevent any pressure when this means is used to retain tubes in position.

Stitch Dressing.—Many operation cases only require one dressing, and that usually takes place about the eighth or tenth day for the removal of the stitches or clips. If the first dressing and also removal of stitches be left to the nurse, it is important to remember in taking out stitches to cut the stitch on one side as near the skin as possible, so that no part of the stitch which has been outside the skin will be drawn through under the skin in the removal of the stitch.

In addition to the instruments given under dressing requisites, a second pair of dissecting forceps and stitch scissors will be required. After removal of the stitches a small gauze and wool dressing, or a collodion dressing, is applied. This dressing is left on for a week, after which no further dressing will be necessary.

Collodion Dressing.—Collodion is required in addition to the usual dressing requisites. The wound having been cleansed, a small dressing of sterilized gauze, or cyanide gauze, is applied fitting closely to the scar. The gauze should be four folds in thickness, and over it a single fold of dry gauze is placed extending for two inches all round. This single fold of gauze is sealed down with collodion, and when dry, a pad of wool is applied and bandaged in position. For small wounds and punctures a wisp of dry wool covers the wound and is painted over with collodion. Whitehead's varnish may be applied in the same way as collodion.

Ointment Dressing. Sterile ointment is evenly spread on sterile lint or gauze and cut to the shape of the wound. After cleansing the wound the spread ointment is applied to fit exactly, otherwise the edges of the wound, if covered with ointment for any length of time, become soft and are liable to slough. Wool and a bandage are then applied. *Stimulating lotions,* such as red lotion, are applied in the same way, after soaking the gauze in the lotion. The dressing covering the ointment or lotion should cover in a large area beyond the wound. When removing a dressing that adheres, a gentle stream of warm saline should be allowed to flow over it until saturated; the dressing is removed by drawing towards the wound to prevent its reopening.

'Tulle gras' Dressing.—Wounds with loss of skin, i.e. granulating surfaces, as occur in burns (see p. 98) are very painful when dressed, unless a protection is used. For these 'tulle gras' is applied directly over the granulating surface. 'Tulle gras' is made of sterile curtain net impregnated with soft paraffin, balsam of Peru, and halibut oil.

Alternative non-oily protectives are sterile celluloid, or oiled silk, which may be used when an oily dressing is contra-indicated.

To pack a Dressing.—After an operation the dressing needs frequent inspection to see if any exudation soaks through the wool and bandage. It is important to bear in mind that germs may gain access to the wound directly the wool which covers the dressing becomes damp, hence the wound is exposed to infection from without when this occurs, unless the dressing is attended to immediately as described below. It is not always necessary to re-dress the wound during the first 24 hours if the dressing is packed.

Method.—The stained external bandage is well damped with carbolic lotion (1–20), after which gauze wrung out of carbolic (1–20), or dry sterilized gauze, is applied and covered with dry wool and a bandage or suitable binder. If the wound cannot be re-dressed at once, a second packing is applied until it can be attended to. Should the second packing be required, it is advisable to remove the first packing before applying it, as it makes a much less bulky dressing and is more comfortable. Packing is only done in cases just operated upon; in others, if the dressing 'comes through,' it is necessary to re-dress the wound. When the wound is enclosed in plaster of paris, and there is exudation, the plaster is enveloped in sterile gamgee tissue, and left undisturbed.

To protect Dressings from Outward Contamination.—This is essentially the nurse's work and one for which she should be held absolutely responsible; it is of the utmost importance as, if neglected, sepsis will result. Contamination of the dressing may take place in two ways, i.e. firstly by exudation from the wound wetting the wool and so allowing the entrance of germs (see packing); secondly by external soaking through the bandage and dressing. The latter method has to be specially guarded against in all operations on the groins (p. 492), hips, etc., where discharges from the genitals may contaminate the dressing, and in extensive operations on the neck

(p. 482), where it is necessary to keep the head straight and the bandage is of necessity near the mouth.

To protect the Dressing.—Cover the dressing with a layer of wool and over this one layer of gauze which should project beyond the dressing for an inch or so. Seal down the gauze with collodion or Whitehead's varnish and hasten the drying by fanning it. This will afford a good protection as long as it remains dry, but must be changed at once if it becomes loose. This method is particularly useful in neck operations, and prevents food, vomit, etc., soiling the dressing; it may also be used for the groin, but is not so satisfactory. For the groin, cut a triangular (p. 139) piece of jaconet and place it waterproof side up over the dressing. One end of the triangle is pinned on the upper and outside of the hip, the second is taken under the hip and brought to meet the first end. The point is pinned over the dressing lying immediately beneath. Care must be taken to see that the base of the jaconet triangle fits well into the fold of the groin and entirely covers the dressing so that it remains dry. In some cases it may not be necessary to keep the jaconet in position all the time; it will suffice to fix it before the use of bedpan, etc.

Occlusive Dressing is one which entirely seals, or shuts in, the wound or excoriation, thus causing any exudate to remain in contact with the damaged surface. It has been proved that the exudate which collects upon such surfaces can be left with advantage for days together, provided the septic re-infection from without is not permitted.

Elastoplast wound dressing provides an occlusive and undisturbed dressing by forming a watertight artificial scab. Two factors are of importance to obtain the best results. First, the dressing should extend for some distance beyond the margins of the lesion, and secondly, the bandage must be in contact with the lesion; the interposition of some dressing, such as plain gauze, appears to interfere with the process of healing, and is disadvantageous.

Application.—Cleanse the abrasion or wound with an antiseptic, such as Dettol (1 per cent), and cleanse the surrounding skin with surgical spirit. When dry, apply Elastoplast directly to the wound, entirely covering it and the surrounding skin for 1–2 inches. Unless severe pain be experienced the dressing is left undisturbed for several days.

May be used for gravel rashes on knees, blisters, burns, cuts, ulcers, impetigo, acne, chilblains, boils, carbuncles, lacerated wounds, warts, and after vaccination.

Another form of occlusive dressing is by coagulation (see p. 99).

CHAPTER XIII

ANAESTHETICS

ANAESTHETICS is the term applied to drugs which produce insensibility to pain either generally or locally.

LOCAL ANAESTHESIA

Local anaesthesia is employed in slight operations of short duration, and also in some serious ones when the patient's condition does not permit of a general anaesthetic.

1. **Cocaine**, or one of its derivatives, novocaine, eucaine, percaine, etc., is most commonly employed. It may be administered by hypodermic (p. 84) or intracutaneous (p. 85) injection for subcutaneous tissues; by painting on the surface for mucous membranes; and by instillation for the eye (p. 626). Novocaine is commonly used for hypodermic injections, as it does not produce toxic results in the same way that cocaine does. No preparation is necessary beyond that required for the operation.

Dangers.—The chief danger is the depressing influence on the heart, some patients being particularly susceptible to cocaine poisoning.

Symptoms.—Pallor of the face, cold clammy sweat, giddiness, and a weak rapid pulse are prominent symptoms.

Treatment.—Lower the patient's head. Administer stimulants and hot drinks, apply warmth to the extremities, and treat as for shock (p. 561). Patients who have had a recent meal are not so likely to feel the ill effects of cocaine.

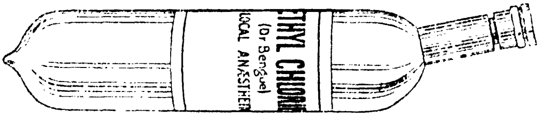


FIG. 186. Ethyl chloride spray.

2. **Freezing.**—Freezing is another form of local anaesthesia. It is produced by spraying the skin with ether or ethyl chloride. No ill effects are produced by its use, but the anaesthesia is very superficial and of short duration. The drug is enclosed in a glass or metal cylinder with a small opening covered with a cap (Fig. 186).

To apply, remove the cap and hold the cylinder about half a yard away from the spot to be anaesthetized and direct the stream on to the spot until the skin appears white; it is then ready. The process takes a few seconds only, so that everything must be in readiness before commencing to anaesthetize the skin.

3. **Regional Anaesthesia** aims at preventing all afferent impulses passing from the area of operation to the cerebral nervous system. It is brought about by the injection of the drug either into the area around the nerve trunk — perineural — or into the nerve trunk — intraneural. This method is commonly used in dental work.

4. **Spinal Analgesia.**—By this method analgesia (p. 364) of the lower limbs and pelvis is produced. It is employed in cases where it is not advisable to give a general anaesthetic, and also for operations on the lower limbs such as excision of varicose veins (p. 468), amputations (p. 475), etc. Stovaine, percaine, or novocaine are the drugs most commonly used.

Preparation.—The patient's blood pressure (p. 202) is taken the evening before and the morning of the operation. He is also given breathing exercises (p. 752) to teach him the correct way to breathe. A mild aperient (preferably the one the patient usually takes) is given the evening before.

Method.—The patient is placed in the lateral position for lumbar puncture (Fig. 39). The skin is purified (p. 437). A special syringe is used with a long firm needle, both of which are carefully sterilized (p. 44). The needle is introduced between the third and fourth lumbar vertebrae, cerebrospinal fluid then escapes, and, after attaching the syringe, a carefully regulated amount of the drug is injected. After injection of the drug the needle is withdrawn and the position of the patient is adjusted by tipping the table so that the anaesthetic solution flows up the spinal canal as far as is necessary for the operation. Spinal anaesthetics cause a considerable fall in blood pressure (p. 204) and a careful watch must always be kept on the quality of the pulse. A small screen should be placed between the operator and the patient's head in order that the patient may not watch the proceedings.

After-treatment.—The patient is placed in bed lying flat, the foot of the bed is raised on blocks for several hours after the operation. The pulse and respiration are counted every 10 minutes for the first hour and every 20 minutes during the second hour: if sudden signs of faintness occur ephedrine may be injected into the buttock. After effects may include headache which may be severe and may be relieved by moving the head gently into the horizontal position, but never raising the head, and by subduing the light. Reading is not allowed for 24 hours. The diet is not altered unless the nature of the operation demands restrictions.

Complications.—Vomiting. Returning sensation may be accompanied by acute pain. Hyperpyrexia (usually of short duration). Trophic changes, e.g. redness and gangrene over the sacrum, see trophic bedsore, p. 363. Temporary paresis of the sphincters, requiring catheterization. Transient squint.

5. **Splanchnic Anaesthesia.**—Many operations are performed on the upper abdomen under local anaesthetics, and to prevent shock occurring in such operations novocaine is sometimes injected into or around the splanchnic ganglia of sympathetic nerves which rest on the crura of the diaphragm. This may be done by direct vision, before the operation is begun, by passing needles between the transverse processes of the vertebrae and into the crura.

GENERAL ANAESTHESIA

Preparation of the patient.—Before the administration of a general anaesthetic it is necessary that the patient should undergo certain treatment known as 'preparation.' This preparation ensures the stomach, rectum, and bladder being empty, each of which is important. (For preparation see Chapter XII, p. 435, the purification of the skin being omitted if the case is not an operation case.) In addition to the preparation carried out by the nurse, the doctor sounds the patient's chest and heart. The urine is tested for albumin and sugar (p. 35), to ensure that the patient is not suffering

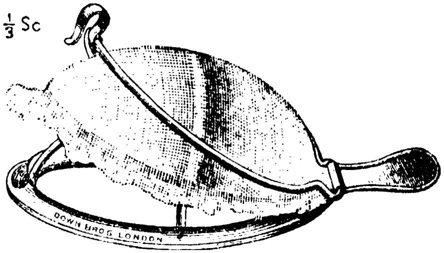


FIG. 187. Schimmelbusch mask for the administration of chloroform. To prepare for use, cover the frame with lint or domette and fasten in position by closing the metal loop.

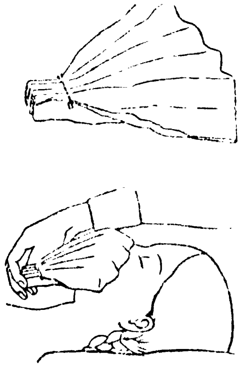


FIG. 188 (*right*). Lint mask showing the method of folding and applying it. The lint is used double.

from any kidney disease (p. 241) or from diabetes (p. 289). It is also necessary to obtain written permission to administer an anaesthetic, from the patient, if an adult, or from the nearest responsible relative if the patient is too ill, or a minor.

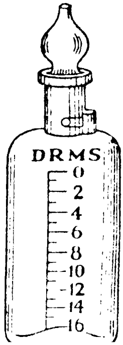


Fig. 189. Chloroform drop bottle.

1. **Nitrous Oxide Gas.**—Nitrous oxide gas is administered through a rubber bag with rubber-face-piece. No special preparation is required before its administration beyond a fast of an hour or two, and no restriction as to diet is required subsequently. The anaesthesia is of short duration, it is, therefore, used for short minor operations such as dental extractions, opening abscesses, etc., and as a preliminary to ether. Given combined with oxygen a longer anaesthesia is produced and major operations may be undertaken.

2. **Chloroform.**—(*a*) *Chloroform administered by the open method.*—For this a Schimmelbusch mask (Fig. 187), or a piece of folded lint (Fig. 188), or the end of a towel, with a drop bottle (Fig. 189) will be needed.

(*b*) *Closed method.*—A Junker inhaler will be required. The Junker inhaler is used when operations on the face and throat are to be performed. The patient's mouth is gagged open and the bent tube is introduced at the side of the tongue, or the tube may be placed in the entrance of the nostril or a mask used as in Fig. 190. It is essential to see that the rubber tubes are connected with the right cannulae, and that the bottle is only half filled with chloroform, otherwise pure chloroform, instead of its vapour, may be pumped into the patient's mouth and a serious burn will result. A modern pattern (Fig. 190)

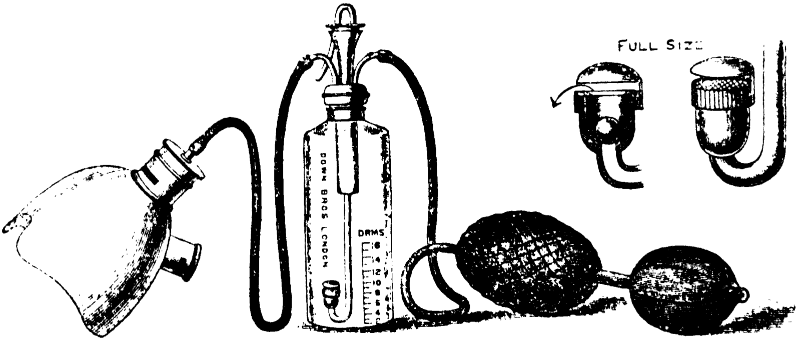


Fig. 190. Junker chloroform inhaler with safety-valve.

with special attachment allows only chloroform vapour to escape. A modification of this inhaler may be had, in which a wide metal tube filled with absorbent cotton is substituted for the chloroform bottle; the absorbent cotton is moistened with chloroform, more being added as required. The inhaler ensures vapour only being pumped into the patient's mouth.

3. **Ether.**—Ether may be administered by the open or closed method.

(*a*) *Open method.*—When ether is administered in this way it is necessary to protect the patient's skin by smearing it with vaseline, or a burn may result (p. 521). It is administered on a mask as described for chloroform; several thicknesses of lint, domette, or gamgee tissue are needed for covering the mask.

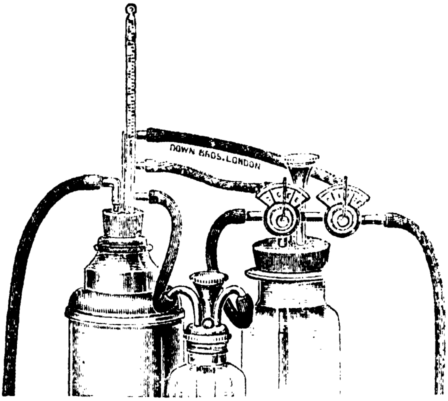


Fig. 191. Shipway's anaesthetic inhaler with extra regulating stopcock for oxygen. No bellows required as oxygen is run direct from oxygen cylinder.

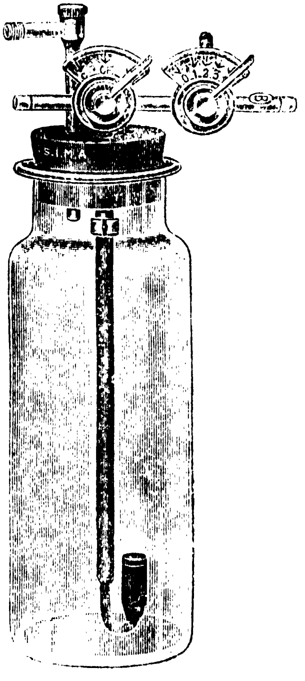


Fig. 192 (*right*). Shipway's (S.I.M.A.) warm ether apparatus bottle fitted with valves.

(*b*) *Closed method.*—A Shipway's inhaler is the one commonly used for this method (Figs. 191–2). Ether may also be given combined with nitrous oxide gas and oxygen.

4. **Intratracheal Insufflation of Ether.—Anaesthesia is induced at**

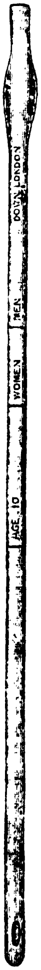


Fig. 193. Shipway's intratracheal catheter.

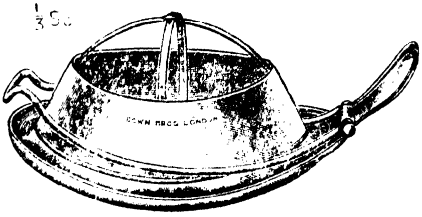


Fig. 194. Anaesthetic inhaler for open ether.

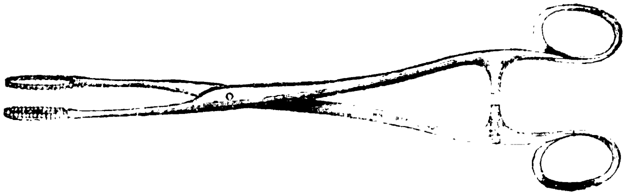


Fig. 195. Sponge holders.

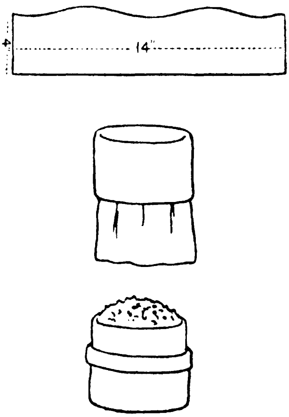


Fig. 196. Improvised ether mask. The upper diagram shows the method of cutting out the cardboard, which is then rolled in a small towel (middle diagram); the end of the towel is neatly tucked in and a sponge placed in the upper opening (lower diagram).

first by the usual method. A soft rubber catheter (Fig. 193) is then introduced into the trachea through which warm moist ether is pumped.

5. **A.C.E. Mixture.**—This mixture is made up as follows: 1 part alcohol, 2 parts chloroform, 3 parts ether. A celluloid mask (Fig. 194) is used for the administration. An emergency ether mask may be made out of cardboard, enclosed in a towel in which a sponge is placed (Fig. 196).

6. **Ethyl Chloride.**—Ethyl chloride is used for small operations of short duration or as a preliminary to A.C.E. mixture or ether. It is administered in a rubber bag with mask if used as a preliminary to another anaesthetic, or it may be poured into a mask.

7. **Basal Narcotics.**—General anaesthesia may be produced without inhalation by the use of *basal narcotics*. Basal narcotics are drugs which can be given safely in sufficient dosage to produce unconsciousness in bed without inhalation anaesthesia. This method is used in many operations where it is inconvenient or inadvisable to promote anaesthesia by inhalation. It has the additional advantage that the patient is sent to sleep in his bed and need not know that he is about to be operated upon, so removing nervous apprehension, less general anaesthetic is required, and there is less vomiting and after-pain.

The drugs chiefly used are evipan, pernocton, avertin, paraldehyde, nembutal, sodium amytal, and soneryl.

Basal narcotics may be administered by (*a*) intravenous injection; (*b*) subcutaneous injection; (*c*) rectal injection; (*d*) or by the mouth.

Preparation is the same as for a general anaesthetic (p. 446): the patient is prepared and dressed for the operating theatre before the drug is administered, except in cases where the patient is nervous and troubled and is not to know the operation is about to take place as in thyroidectomy, see p. 482.

(*a*) *Intravenous injection* (Figs. 197–8).—The drugs most commonly used are evipan and pernocton; these have superseded a mixture of ether in saline which was formerly employed. This method may be used alone to cause complete anaesthesia, or as a form of premedication, followed by gas and oxygen, or it may precede spinal anaesthesia. The solution requires to be freshly prepared shortly before use. The dose varies with the age of the patient and length of anaesthesia required. The injection is made very slowly into a vein in the arm as described on p. 76. The patient becomes unconscious in 15–25 seconds and anaesthesia lasts 20–30 minutes. The usual care of a patient receiving a general anaesthetic is necessary, i.e. the head is kept turned to one side, the tongue must not be allowed to fall back and obstruct respiration, or an airway is used.

(*b*) *Subcutaneous injection.*—A hypodermic injection of morphia, or morphia with atropine, may be employed prior to the administration of a general anaesthetic by inhalation. By this means sleep is induced and the patient calm and unworried when the anaesthetic is commenced. The injection is usually ordered to be given 30–45 minutes before the anaesthetic is to be given. The patient's preparation is completed before the injection is given so that he is not disturbed after having the morphia. Two injections may be ordered, the first given one hour before the anaesthetic, the second half an hour later.

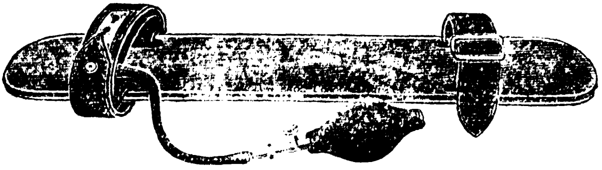


FIG. 197. Arm support and tourniquet (Dickson-Wright) for steadying arm during intravenous anaesthesia.

Atropine is commonly ordered as a subcutaneous injection prior to operations where it is necessary to restrict secretion of saliva and mucus and has no narcotic effect.

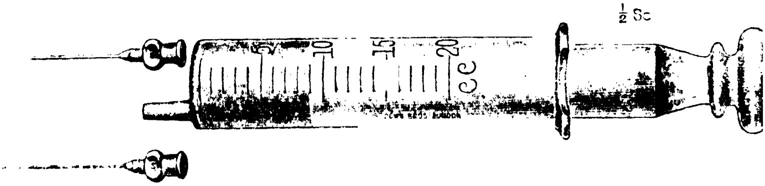


FIG. 198. Syringe for intravenous anaesthesia.

(*c*) *Rectal injection.*—The basal narcotics most commonly used for this method are avertin and paraldehyde.

Dosage.—Avertin is the bromine analogue of chloroform (latter is $CHCl_3$, and avertin is $CHBr_3$). The amount of the drug varies and is regulated by the weight of the patient, a usual amount being 0·1 gramme of avertin for every kilogramme of the patient's weight, the solution is made up to 2½ per cent in distilled water, must be freshly prepared and given before the liquid falls below 90° F., otherwise the drug comes out of solution. The solution requires to be tested before use with Congo red, and if any blue appears the solution is not fit for use. Paraldehyde: 1 drachm per stone of body weight, maximum 10 drachms in 10 per cent solution in normal saline.

Preparation.—In addition to the usual preparation (p. 446) a rectal saline wash out (p. 61) is given. Glucose should always be given as a routine before avertin and paraldehyde to prevent acidosis.

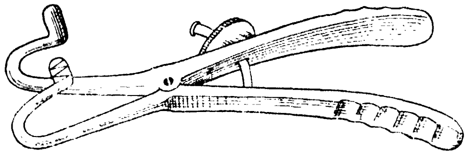


FIG. 199. Mason's mouth gag.

Method.—As soon as the rectum is empty, the freshly prepared avertin is slowly run into the rectum at a temperature of 90° F. (never higher), using a rectal tube and funnel, the patient lying in the left lateral position. (For method see p. 58.) The patient generally goes to sleep whilst the injection is being given and is ready for operation in 40–45 minutes.

(*d*) *By the mouth.*—Nembutal may be given either intravenously as described, or by mouth. By mouth it is taken in capsule form; two capsules are given one hour before operation is to take place and repeated in 20 minutes if the patient is not sleeping. Sodium amytal and soneryl are also given by mouth.

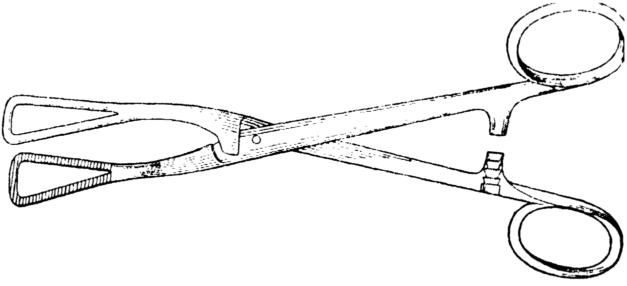


FIG. 200. Tongue forceps.

Necessary requisites.—The following articles should always be in readiness when a general anaesthetic is to be administered, in addition to the necessary apparatus for its administration already described: Small tray containing sterile hypodermic syringe (p. 84), pituitrin, adrenalin, cortin, coramine, strychnine, brandy, strong ammonia, measure glass, gag (Fig. 199), tongue forceps (Fig. 200), wedge, spatula or tongue depressor, vaseline or simple ointment with a piece of lint; hot and cold water; small vomit bowl; hot bottles filled and covered. Cylinder of oxygen and carbon dioxide.

AFTER-TREATMENT

The patient is carried back to bed with the head low and, if possible, turned to one side. When on the bed he is covered with warmed blankets (p. 461), one being placed next to him before the sheet (see operation bed, p. 24). Hot-water bottles, or an electric hot pad, well protected with good flannel covers, must be arranged in the bed around him in such a way that they cannot come in contact with the patient's body and yet may create a warm atmosphere around him (for method see p. 29), the object being to raise the temperature of the whole body, not of one particular part. (For arrangement of hot bottles see p. 29.) Some surgeons forbid the use of hot bottles in these cases; this the nurse should ascertain beforehand. The nurse must remain by the bed until the patient has sufficiently recovered to be able to speak to her, he may then be allowed to sleep; absolute quiet should be maintained and a watch kept to see that he is all right. A patient who has had a basal narcotic (p. 450) may not completely recover consciousness for some hours, although he may appear to have been awake. During this period he may be restless or excited, and need vigilant attention. He may also suffer from inefficient respiration, breathing being slow and shallow. The patient becomes pale, grey and cold, and in danger of severe collapse. Carbon dioxide 7 per cent in oxygen is administered as a respiratory stimulant; and requires always to be in readiness. If a patient shows no sign of waking he should be roused if only for a moment, he may then be allowed to sleep. Before leaving the bedside the nurse must ascertain that the patient has ' come round,' that the pulse is good, and that he is a good colour and breathing naturally, and if there is a dressing, that it is in position and that no blood is oozing through. A towel should be arranged around the patient's neck and a dish put within his reach, in case he should vomit before the nurse gets to him. Enamel or papier-mâché kidney-shaped trays are the most convenient for this purpose as they fit closely to the cheek.

POSITIONS

The following positions are commonly used when the patient is under an anaesthetic (for gynaecological examining positions see Chapter XXII, p. 676). During the administration of the anaesthetic the nurse should stand beside the table or bed. It is often a comfort to a nervous patient if the nurse holds the hand, but restraint should not be used until the patient shows signs of becoming restless, in which event a considerable amount of force is required with some cases. Many anaesthetists prefer the patient to clasp his hands together across his chest. When anaesthesia is induced the patient is placed in the required position according to the directions of the surgeon.

1. **Dorsal Position.**—The patient remains flat on his back, the hands being placed either under his back so that he lies on them or they may be clasped over the chest or they may be fastened to the head of the table with suitable handcuffs, care being taken to see that the arms are not raised above a right angle. It is most important to see that the arms are suitably placed, otherwise the arm may hang over the edge of the table, with the result that when the patient recovers from the anaesthetic the musculo-spiral nerve may be paralysed (see p. 367).

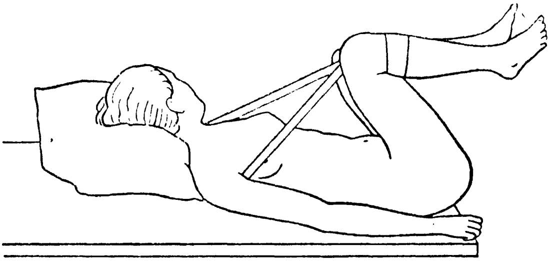


Fig. 201. Lithotomy position (Clover's crutch applied).

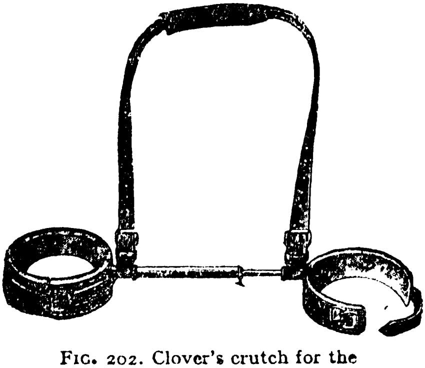


Fig. 202. Clover's crutch for the lithotomy position.

2. **Lithotomy Position** (Fig. 201).—This position is used in many operations on the following: rectum (p. 497), bladder (p. 492), perinaeum (p. 682), external genitals (p. 492), and gynaecological cases (p. 679).

When under the anaesthetic, the nurse should tuck up the patient's gown around the waist under the blanket, and in the case of a woman, arrange a towel over the vulva. The garters of the Clover's crutch (Fig. 202) are then fastened around the legs below the knees. The bar of the crutch must be with the buckles uppermost or it will not be possible to fasten the strap. When the garters have been fastened, the strap is passed over the patient's left shoulder and under the right armpit, and fastened in such a way that the legs are flexed on the abdomen. The patient is then lifted into position at the end of the table by two people. Some examining-tables are fitted with an upright bar to which a stirrup is attached. The patient's feet may then be suspended in the stirrups after flexing the thighs. Should these means not be available, the patient's legs should be flexed and the ankles securely fastened to the wrists on either side. Another way is to pass a narrow sheet folded lengthwise, or stout webbing, round the shoulders and secure it around the legs just below the knees. For operations performed in this position care is needed to see that the legs are covered entirely with sterilized towels, otherwise it is difficult to avoid touching them.

3. **Trendelenburg Position.**—A position used for intrapelvic operations such as prostatectomy (p. 492), hysterectomy (p. 510), etc. In this position the abdominal viscera fall away from the pelvis, so rendering the pelvic organs of more easy access when the abdomen is opened.

Operating-tables are nowadays all made so that the patient may be placed in this position. The patient's legs are secured to the table, the lower end of the table is then raised to the required angle by means of a lever or handle. Shoulder straps are adjusted to prevent the patient slipping. This position may not be maintained during the whole of the operation, therefore the nurse should be familiar with the lever enabling her to alter the position if desired by the surgeon. A substitute for a Trendelenburg table may be made by inverting a chair to form an inclined plane, or raising the foot of the bed or table on high blocks after securing the patient's legs. The arms are placed above the patient's head, but not beyond a right angle; the head is turned to one side.

4. **Lateral Position.**—Used in some operations on the kidney (p. 489). The patient is turned on to one side with a large sand-bag placed under the lumbar region. The arms need careful adjustment.

COMPLICATIONS

The following conditions may occur either during or after the administration of an anaesthetic—that is, until consciousness is regained—and may happen independently of the cause for which the anaesthetic is given or its duration.

1. **Obstructed Respiration.**—Obstructed respiration may occur from the tongue falling back, or from the entrance of vomited matter into the air passages or lungs.

Symptoms.—The symptoms are cyanosis (p. 188), difficult and noisy breathing.

Treatment.—Turn the patient's head so that the tongue falls to one side and draw the jaw forward by pressure with the fingers just below the angle of the jaw on either side. If this is not sufficient, the mouth must be gagged and the tongue drawn forward with tongue forceps (Fig. 200). If due to vomited matter, the mouth is gagged open (there may be great difficulty in unclenching the teeth) and the pharynx cleared with the finger or a sponge on a sponge holder. If the air passages cannot be cleared by this means and the patient is suffocating, tracheotomy will have to be performed; it is, therefore, incumbent on the nurse to send for help at once if the anaesthetist is not at hand and she cannot relieve the patient. Meanwhile, she should allow the patient's head to hang over the edge of the bed and perform artificial respiration (p. 549), fixing the handles of the tongue forceps in such a manner that the tongue is kept well protruded.

2. **Shallow Inefficient Respiration** may occur when patients have had basal narcotics administered; the face becomes pale and grey and cold and there is danger of severe collapse. Carbon dioxide 7 per cent in oxygen is administered until the respiration becomes deeper and efficient.

3. **Complete Cessation of Respiration.** — The *symptoms* are: Cyanosis or pallor, absence of respiration.

Treatment.—The patient's tongue is drawn forward and the head placed over the edge of the table or bed, or if a child, it is often suspended for a few seconds by its feet. Artificial respiration (p. 549) is begun, whilst the chest is flicked with a cold wet towel, or douched with hot and cold water. Strychnine and ether may be required by the anaesthetist and the faradic battery is sometimes employed. Oxygen and carbon dioxide in oxygen should be procured if not at hand.

4. **Faintness** is treated by rubbing the face vigorously, lowering the head and raising the pelvis, flipping the chest with wet towels, and fomenting the precordia.

5. **Cardiac Failure.**—Cardiac failure may result from fright during the administration, or from shock brought about by the operation having been started before anaesthesia was sufficiently deep, or from an overdose of chloroform. Adrenalin, whether injected or applied to a wound is dangerous, either during or after chloroform anaesthesia, as it may cause ventricular fibrillation.

The treatment is the same as that given for cessation of respiration. In addition a few drops of ammonia may be sprinkled and held to the nostrils, or nitrite of amyl may be required. Hot bottles and abdominal fomentations may also be needed.

POST-ANAESTHETIC COMPLICATIONS

1. **Anaesthetic Burns.**—These may happen either in the eyes or around the nose and mouth, or on any part of the face. They are caused either by the anaesthetic running down off the mask when the sponge or lint has become saturated, or from spilling the drug. Some patients have particularly sensitive skins, and for this reason, when ether is to be administered, the skin on the face is previously smeared with vaseline or castor oil. Conjunctivitis (p. 631) may occur as a result of the patient not shutting the eyes.

After-treatment.—The skin is anointed with eucalyptic vaseline or the ointment prescribed; in extensive burns a mask must be worn. If the eye is affected it is bathed with saline solution, the surrounding skin is smeared with vaseline, and cold flaps are applied (p. 625).

Patients who suffer from post-anaesthetic vomiting frequently get a sore skin around the mouth; to prevent this the skin should be kept smeared with eucalyptic vaseline. It is well to apply vaseline to any part of the face on return to bed after an anaesthetic if there is any redness to be seen.

2. **Post-anaesthetic Vomiting.**—Vomiting is a frequent complication after the administration of a general anaesthetic. It occurs as the patient is 'coming round,' and in the majority of cases is slight and ceases after an hour or two without further treatment. In other cases it may continue and become very distressing, and in very severe cases may cause death from exhaustion. Nervous patients are more prone to it than others, and it occurs most frequently after abdominal operations and extensive operations on the neck. The vomit is clear at first, then becomes bile-stained and more copious (see vomit, p. 184). As a *preventative* glucose, drinks or sweets, given for several hours prior to the anaesthetic, prove very effectual (p. 460).

Treatment.—No food is allowed by mouth, sips of hot water and glucose may be given to relieve thirst, or a slice of lemon may be sucked (p. 15). Ice is sometimes allowed, but it is not satisfactory, as the thirst is only increased and the sickness is not stopped. It is also liable to harden the mouth and cause the lips to crack. Rectal saline with glucose (p. 58) allays thirst better than anything and may be given with the addition of the white of an egg or glucose, until nourishment can be taken by the mouth. The saline may be administered every four or six hours unless otherwise ordered (for method see p. 58). Brandy may be prescribed to be given with the saline if the patient is becoming collapsed.

If vomiting persists the following treatment may be ordered: A warm drink consisting of bicarbonate of soda ʒj with water ℥vj; this will probably produce vomiting and so wash the stomach out, if it is retained it will do no harm and the vomiting may cease. A mustard leaf to the epigastrium (p. 94). If the sickness still continues one of the following may be successful: Tincture of iodine ♏iij in water ℥j, repeated at intervals of one hour until three doses have been given. Sal volatile ʒj in soda water ℥j; hot black coffee; a small cup of tea; iced champagne; inhaling vinegar; turpentine enema (p. 63). Should all treatment be unsuccessful, the surgeon will probably wash the patient's stomach out (see lavage, p. 64).

When the sickness ceases small quantities of liquid food may be given, either hot or cold whichever the patient retains best, but hot will be found the most refreshing. Once food is retained and digested, the sickness stops or becomes less frequent, the quantity is gradually increased until full liquid diet is taken; light diet is then given. Should the patient take a fancy to some particular food and it does not interfere with the treatment, it may be given, and it will probably be retained. After abdominal operations the sickness may be caused by distension and flatulence (p. 502), or be due to some complication resulting from the abdominal condition; this sickness is of a different nature, the treatment of which will be found under abdominal nursing (p. 503).

Hysterical patients need firm treatment or they may get into a habit of vomiting. If the nature of the operation permits, these patients are often ordered a light solid diet, and even though they vomit, some food is probably retained and the sickness gradually ceases. A hypodermic injection of morphia may be ordered for post-anaesthetic sickness; in some cases this stops the sickness, in others it increases it. It must of course be understood that none of the above-mentioned treatment is given without the surgeon's orders.

Delayed Chloroform Poisoning.—Acidosis, Ketosis.—This condition most commonly occurs in children, and becomes manifest about 12 hours after the administration of the chloroform.

Symptoms.—Continual vomiting; the vomit has the appearance of beef-tea, and persists in spite of treatment. The child is apathetic and drowsy, the breath smells of acetone (p. 289). Acetone and diacetic acid are found to be present in the blood and urine (p. 38). Coma (p. 293) usually supervenes and death occurs about the fifth day.

Treatment.—The child's strength is maintained as far as possible. Saline and dextrose are given by the rectum every four hours. Fruit juice and glucose in large quantities is given by mouth if retained. Subcutaneous or intravenous infusion of saline may be required. (For preparation see p. 74.) The child is kept as warm as possible, and a generous supply of fresh air is necessary.

The urine is tested twice daily for acetone (p. 38), to see if improvement is taking place.

CHAPTER XIV

THE NURSING OF OPERATION CASES

UNDER this heading it is desirable to deal simply with the preparation and after-nursing required for most of the commoner operations. It is impossible to deal with the disease and its course, which should be read up in a treatise on surgical diseases.

In order to avoid repetition, the general nursing of surgical cases is described here; any additional nursing required for special operations will be found under their respective headings.

In all cases about to undergo an operation, or to have a general anaesthetic administered, it is necessary to obtain written permission from the patient, if an adult, or from the nearest responsible relative if the patient is too ill, or a minor. The nurse is usually responsible for this.

General Preparatory Treatment.—This treatment commonly commences the day before the operation, but it is more satisfactory, and in the case of major operations absolutely essential, for the patient to be under treatment and nursing for several days before the operation.

The nursing prior to the operation includes a daily bath or blanket bath (p. 11); careful regulation of the bowels; the administration of plain, nourishing, and easily digested food; rest; various drugs may be prescribed, and, except in cases of diabetes, glucose drinks and glucose sweets are given 24 hours prior to the operation to prepare the system for the strain to be put upon it. The temperature and pulse should be recorded twice a day in order to note any variation. The quantity of urine passed should be noted and a specimen tested (p. 35). Any abnormal symptom noticed during this time should be reported to the surgeon (for description of symptoms see Chapter V). It is well to accustom the patient to the use of bedpans, urinals, etc., and the position that will have to be maintained after the operation. It is also advisable for the patient to become accustomed to the nurse and his surroundings.

Preparation of the patient.—This includes the preparation described on p. 435, in addition a hypodermic injection of morphia and atropine, or other basal narcotic (p. 450), or atropine only, may be ordered (p. 451). In serious cases a rectal saline may be prescribed, half a pint of normal saline being given one hour before the operation is to take place (for method see rectal saline, p. 58).

Purification.—See p. 437.

Dressings required.—Sterilized gauze, wool, ribbon gauze; adhesive plaster; suitable bandages according to the part to be operated on (p. 129). Safety-pins. Other appliances needed will be found under the respective operations.

Immediate after-treatment of anaesthetic and operation cases, see Chapter XIII, p. 453.

General Post-operative Nursing.—After the operation the patient is put back to bed (p. 24), and kept in the recumbent position with the head turned on the side until the effects of the anaesthetic have passed, after which should any than the recumbent position be prescribed, the patient is carefully adjusted in position (for positions see p. 26).

Pulse.—The pulse is taken on return from the operation every half-hour for two hours afterwards, then twice a day for two days, after which, except in major and orthopaedic operations, once a week is usually sufficient.

Temperature.—The temperature is taken night and morning, unless otherwise stated. Respiration is usually only taken in special cases.

Dressing.—The dressing must be inspected on return from the operation, then every half-hour for the following hour, after which every two hours during the next eight hours will suffice, unless it is an operation after which haemorrhage is likely to occur. Should there be any discharge oozing through the dressing, it is immediately packed (p. 442) to prevent infection of the wound. The dressing should be suitably protected on return from the operation if it is one that may become contaminated with external discharges (p. 443).

After-dressing.—The wound is dressed on the second day after the operation in cases in which a drainage tube has been inserted (p. 440). Stitches or clips are removed between the eighth and tenth days in the majority of cases (see stitch dressing, p. 441). The surgeon commonly does the first dressing and also removes the stitches.

Quiet.—The patient should be kept quiet and encouraged to sleep after he has regained consciousness from the anaesthetic. No visitors should be allowed until the surgeon gives permission. Excitement may be a cause of reactionary haemorrhage (p. 564).

Diet.—When post-anaesthetic vomiting (p. 457) ceases, small quantities of albumin water, tea, coffee, or milk diluted with either water, soda water, or lime water are given. Later, the usual diet is allowed, except in special cases mentioned under each operation.

Vomit.—Note must be made of the vomit, i.e. quantity, frequency, colour, and odour (see vomit, p. 184). A specimen is kept for inspection (p. 31) if in any way abnormal. (For post-anaesthetic vomiting see p. 457.)

Urine.—The quantity of urine passed in the first 24 hours must be noted, and also how soon after the operation it was passed. A specimen should always be tested (p. 35) or put up for examination the following morning. It is not necessary to continue the measurement of urine unless the patient is suffering from retention (p. 238) or in special cases mentioned later. Urine may not be passed for some hours after the operation, this need cause no anxiety up to 12 hours. If at the end of 12 hours the patient still has retention the means advised under retention of urine (p. 238) should be tried, and if these fail, as a last resource when retention has lasted 16 hours a catheter must be passed (see catheterization, p. 66). The nurse should ascertain beforehand what the surgeon wishes as regards the passing of a catheter, as this should not be done without his consent. On the other hand, retention should not be allowed to continue for as long as 24 hours or atony (loss of tone) of the bladder may result from over-distension.

Bowels.—An aperient is usually ordered to be given on the second night after an operation, exceptions are noted under the various operations. Any unusual appearance of the motion should be noted and reported, the stool being kept for inspection (p. 31). (For abnormal symptoms see p. 185.)

In the nursing of operation cases the nurse must possess a knowledge of, and be on the look-out for, the first symptoms of unfavourable complications (see Chapter XVII). Should they arise she must be able to give a clear, concise, correct, and unexaggerated report of the same to the surgeon; a successful issue much depends on whether the untoward symptoms are recognized and reported directly they become apparent, the surgeon is dependent on the nurse in this matter during his absence. The nurse may not alter or order any treatment, medicine, diet, etc., without having received instructions from the surgeon, except in the case of an urgent and unexpected complication arising, when she must use her common sense together with her knowledge of the usual treatment of the complication until the surgeon's orders are received. These exceptional occasions are the only times in which she should act without waiting for orders. It is useless to allow the patient to die of haemorrhage, or shock, because the surgeon was not at hand to give orders, or for the nurse to do nothing and say she was awaiting his instructions; generally speaking, the surgeon gives instructions for all probable complications that may arise, and if he does not do so, the nurse should find out beforehand what his wishes are in the event of urgent complications arising. It should be the aim of the nurse to provide the patient with anything that is suitable and likely to add to his comfort even though it may not be absolutely essential; for instance, a water pillow or air cushion to sit on when the Fowler position (p. 26) has to be maintained, or a pad or small pillow to relieve backache when the patient has to lie without turning. Some nurses nowadays think that the less they do the better; it is really a matter of laziness and selfishness on their part when they will only do the absolutely necessary things, leaving the patient without those comforts which a good nurse would provide when they can be procured.

Patients are not allowed to wash themselves, or do their hair, until the wound has had the stitches removed, or the surgeon has given permission for them to sit up and move about in bed. Caution is needed in moving about for a day or two after the stitches have been removed or the wound may reopen if it is a large incision and much strain is put upon it. When this occurs it is commonly due to faulty nursing. After some minor operations, patients are allowed to sit up the day after the operation, and may be allowed to wash themselves with a little help. Major operation cases must be lifted by two nurses during the first four to seven days for bedmaking, etc. (p. 20), bedpan (p. 19), etc., and in the case of a limb, one nurse should support the limb whilst the sheet is attended to.

Getting up.—The time the patient is confined to bed naturally varies considerably. Slight operations on superficial tissues in a part that can be kept at rest with the patient up are allowed up after a few days. Others of a more serious nature where deeper structures are involved may be kept in bed for two or three days after the stitches have been removed, i.e. about a fortnight from the day of operation. Encouraging the patient to move about in bed from the day of operation and to get up earlier is now commonly advised by many surgeons. Abdominal cases get up on the fifth day. This movement by assisting the circulation acts as a preventative of thrombosis, wasting of muscles, adhesions and functional disturbances arising from a patient maintaining one position for any considerable time. Special cases are dealt with under the various headings later. The after-treatment and nursing of operation cases varies with each surgeon; it is, therefore, possible only to give a general outline, which will need to be altered and adapted to the directions of the surgeon for whom the nurse is working.

Unfavourable symptoms.—Persistent daily rise in temperature, even though it may be slight; pain; persistent vomiting; rigor.

Complications.—Shock (p. 561); haemorrhage, primary and secondary (p. 563); sepsis (p. 568).

OPERATIONS ON THE SKIN

The chief of these are incising boils (p. 413), carbuncles (p. 414), whitlows, abscesses, and the excision of ulcers (p. 567).

Preparation for general anaesthesia (p. 446).—In some mild cases a local anaesthetic may be given (p. 444).

Purification (p. 437) *for the surrounding skin.*—The inflamed area is swabbed over with carbolic (1–20), then washed with perchloride (1–2000), and an antiseptic dressing or fomentation (p. 90) is applied as ordered.

Dressings required.—Usual dressings (p. 40), in addition lint and jaconet in case a fomentation is required.

Appliances.—Cradle if a lower limb has been operated on, also pillows for raising it.

Position.—Recumbent.

Diet (p. 790).—A plentiful, nourishing diet is required, stimulants may be prescribed.

Temperature, pulse, and respiration are taken every four hours in severe cases until normal, then twice a day.

After-dressing.—The wound is dressed daily, or twice a day. If fomentations (p. 90) are ordered they are changed every four hours or oftener.

Nursing.—These patients are often in a very debilitated condition. They require careful nursing, rest, and as much food as they can digest. The bowels need careful regulation in order to help in the elimination of toxins. If left to the nurse to administer, aperients must be given with caution, as in debilitated persons diarrhoea may be caused and prove serious. Care is needed in dressing the wound (p. 440) to prevent further infection. Carbuncles commonly occur in diabetic (p. 289) patients and may prove fatal. Treatment is prescribed for any condition which may be the cause. Vaccine treatment is given in some cases. The patient remains in bed until the temperature is normal and the wound is healing well. Fresh air is a necessity.

Unfavourable symptoms.—Pain; continued rise of temperature and pulse; cellulitis (p. 569); extension of the inflammation and suppuration (p. 569); swelling of the glands in the neighbourhood; rigors; headache; drowsiness.

Complications.—Septicaemia (p. 575); pyaemia (p. 577); secondary haemorrhage; coma if the patient is diabetic (p. 289).

Skin Grafting.—An operation in which a piece or pieces of skin are removed from a healthy part and applied to a wound with loss of skin. Performed in cases which have undergone extensive operations necessitating removal of a large area of skin, as in extensive breast amputations (p. 488), or injuries involving the skin extensively as in burns (p. 521).

Preparation for general anaesthesia.—See p. 446.

Purification of the limb from which the graft is to be taken is by washing with soap and water, or saline, and the application of a saline or spirit compress (see p. 94). The area to be grafted is cleansed with sterile saline solution, the surrounding skin is cleansed with ether soap, followed by spirit, and finally saline solution. The wound, after cleansing, is covered with a sterilized dressing wrung out of saline solution; no antiseptic is employed.

Dressings.—'Tulle gras' (p. 442) and the usual dressings. Sterile green protective with holes cut for drainage or celluloid (p. 43) may be needed, and until required should be placed in warm sterile saline solution.

Appliances.—Splints may be required according to the position of the wound. Cradle if a lower limb, with sand-bags and pillows for raising it.

Methods.—There are three principal methods: Reverdin's, Thiersch's, and by tubular grafts.

Reverdin's method.—Tiny cones of skin are picked up from the cleansed healthy area on the point of a needle, cut off with a sharp scalpel and placed at intervals on the granulations which have previously been irrigated with normal saline. The grafts are covered with sterile perforated celluloid, kept in position with strips of strapping, and covered with a saline gauze compress and protective. The celluloid is not removed for eight days, but the compress may be renewed twice daily after saline irrigation.

Thiersch's method.—Large, very thin grafts are cut with a razor from the cleansed healthy area and used to cover the granulating wound which has been cleansed with sterile saline solution and covered with sulphonamide powder. The graft is covered with 'tulle gras,' then gauze dressing (thick) and firmly bandaged with a crêpe bandage. Pressure is needed to prevent any space between the grafts and the granulations in which serum might collect. The dressing is untouched for eight days, then soaked off with saline. Another method is by the use of Stent cast—an impression of the surface in softened dental wax—on which the grafts are laid after smearing the wax with vaseline. The grafts are laid on the cast, then applied accurately to the granulations and fixed with strapping which is replaced on the fourth day by 'tulle gras' dressing.

Tubular grafts are made by selecting a part which can be approximated to the part to be grafted. The required amount of skin with subcutaneous fat is then raised and made tubular by stitches leaving the ends uncut. After a few days one end is divided, the tube opened and laid on the surface to be grafted. After an interval to allow the circulation to develop, the other end is cut. These grafts are superior in strength and appearance.

After-dressing.—The wound is commonly dressed about the eighth day, when, if satisfactory, the grafts will be adherent to the wound and 'tulle gras' dressing (p. 442) may be applied until it has healed. The limb from which the graft was taken is dressed with triple dye jelly (p. 99) and left undisturbed until healed (two weeks).

Nursing.—The patient is maintained in the position that will give most rest to the grafted part. It is of the utmost importance to keep the part at absolute rest, or the grafts may become detached and 'not take,' thereby necessitating another operation. If the wound is at the back of the leg, for instance, a Nathan Smith's rod splint is applied, and the leg is suspended so that nothing may come into contact with the grafted area or a plaster cast (p. 182) may be applied.

Complications.—Sepsis. Death of the graft.

OPERATIONS ON TENDONS, MUSCLES, AND BURSAE

Tendons.—1. **Suturing a Tendon** is performed in cases of ruptured tendon, and consists in reuniting a tendon which has been torn across as a result of an injury. Operations are also undertaken for lengthening a tendon, to overcome deformity resulting from loss of substance of a tendon. Shortening a tendon is performed in some conditions resulting from paralysis (p. 361).

2. **Tenotomy** is the division of a tendon through an open or subcutaneous wound, performed in cases of deformity due to contraction of the tendon as in talipes (p. 613); or to assist at the reduction of some displacement, such as a dislocation (p. 544), or the reduction of a fracture (p. 529).

3. **Tenoplasty** is a term applied to any plastic operation on tendons, the three chief being: **tendon implantation,** in which the action of healthy muscle is transferred to the tendons of a weakened

or paralysed group; **tendon transplantation**, which is done to displace the line of action of a muscle in order to counteract deformity; **tendon grafting**, which is the transference of a healthy tendon to replace a lacerated one.

***Preparation for general anaesthesia.*—See p. 446.**

Purification.—See p. 437.

Dressings.—See p. 40. *After-dressings.*—See p. 440.

Appliances.—Suitable splints or plaster of paris, strapping. Cradle if a lower limb, sand bags and extension cloth for steadying the limb.

Position.—Recumbent for the first few days, after which time the patient is allowed to move about in bed provided it does not interfere with the required position of the part operated on. The patient remains in bed until the tendon has united in the case of a lower limb, but in the case of a small tendon in the arm or hand he will probably be allowed up with the arm supported in a sling. Massage and exercises (p. 745) may be ordered later. After tenoplasty, the limb is immobilized for a longer period, being put up in plaster of paris (p. 162) or splints for at least six weeks. A supporting apparatus is worn subsequently for six months or longer, during which time massage and exercises are given.

Complications.—Sepsis (p. 569). The tendon giving way, generally due to undue movement before it has become firmly united.

Muscles.—Operations on muscles consist chiefly in the removal of benign tumours and bursae.

Varieties of Tumours.—(1) ***Adenoma***, a tumour formed by hypertrophy of a lymphatic gland; a tumour of the mammary gland formed by hypertrophy of the proper gland structure. (2) ***Angioma***, a tumour composed of vascular tissue (blood-vessels). (3) ***Chondroma***, a cartilaginous tumour growing in connection with bone or cartilage. (4) *Cyst*, a tumour consisting of a sac containing solid or liquid substance. *Dermoid* cyst may contain skin, hair, and nails. *Sebaceous* cyst is caused by obstruction to the excretory ducts of a sebaceous gland. (5) ***Fibroma***, a tumour consisting of overgrowth of fibrous tissue. (6) ***Lipoma***, a fatty tumour which may be subcutaneous, or deep and intermuscular. (7) ***Lymphangioma***, a tumour of the lymphatics. (8) ***Neuroma***, a tumour growing in connection with a nerve. (9) ***Osteoma***, a bony tumour. (10) ***Papilloma***, a morbid growth or neoplasm, of a conical form resembling that of a teat.

Excision of any of the above-mentioned tumours may be performed. (For preparation and after-nursing see p. 460.)

Excision of a bursa is undertaken for inflammation and enlargement of a bursa, the commonest form being that known as prepatella bursa or housemaid's knee. (For preparation and after-nursing see p. 460.)

SCALP

The following tumours may require removal from the scalp: lipoma, papilloma, fibroma, adenoma, dermoid and sebaceous cysts, epithelioma, and sarcoma (p. 314).

For small tumours and cysts a local anaesthetic (p. 444) is usually given. A small dressing, or a collodion dressing (p. 441), may be applied subsequently. It is not necessary for the patient to be kept in bed. For the larger tumours the preparations and after-nursing are as described on p. 460.

OPERATIONS ON ARTERIES AND VEINS

1. **Ligature of Vessels.**—This operation consists in tying an artery, and is performed to arrest the flow of blood to the periphery; it may be undertaken for any of the following conditions: to check haemorrhage; to promote the cure of an aneurysm (p. 278); to diminish the growth of a tumour; or as a preliminary to the removal of some vascular organ such as the tongue.

2. **Complete Extirpation of an Aneurysmal Sac** may be performed as a radical cure of an aneurysm.

Preparation for general anaesthesia.—See p. 446.

Purification (p. 437).—Special care is needed in the thorough cleansing of the nails if a limb is to be operated upon.

Dressings required.—See p. 40.

Appliances.—Cradle if a lower limb has been operated upon, pillows to raise the limb.

Position.—Absolute rest in bed in the recumbent position. The patient will be kept in bed three weeks or longer.

Diet.—Full, very little meat. No stimulants.

After-dressing.—See p. 440.

Nursing.—No special treatment beyond absolute rest in bed is required in most cases, but if the main artery of one of the extremities has been tied, the limb is wrapped up in aseptic wool and kept slightly raised. If there is any likelihood of gangrene (p. 573) it is thoroughly purified (p. 437).

Unfavourable symptoms.—Rise of temperature above 100° F.; pain; cold and pallid extremity, or swelling and discoloration of the limb below the ligatured artery.

Complications.—Secondary haemorrhage (p. 564); gangrene (p. 573).

Excision of Varicose Veins.—Performed in cases of varix (p. 279) and also in some cases of phlebitis (p. 281) of superficial veins of the lower limbs. (For varicose veins of the scrotum, see varicocele, p. 495.)

Preparation for general anaesthesia (p. 446).—Spinal analgesia is used in some cases (p. 445).

Purification (p. 437).—When purifying the limb the varicose veins must be marked out with blue pencil whilst the patient is standing, as it is often impossible to detect them when the patient is lying on the operating-table.

Dressings required.—Usual dressings and, in addition to the gauze usually supplied, a packet rolled as a bandage and sterilized.

Appliances.—Pillows for raising the limb; sand-bags and extension cloth to steady it; cradle.

Position.—Recumbent, two pillows allowed for the head. The limb is raised on two pillows and kept steady by placing the extension cloth across the limb and fixing the ends between sandbags. When the stitches have been removed the leg is placed flat, the cradle is discarded, and the patient is allowed to sit up in bed. The patient is kept in bed three weeks from the day of operation in order to allow clots to become firm and for the circulation to accommodate itself to the new arrangements. Healing may be slow if the skin is very thin. When allowed to get up, a crêpe velpeau bandage may be ordered for the limb to support it, and is continued for a week or two.

Diet and dressing as usual (p. 460).

Unfavourable symptoms.—Persistent rise of temperature above 100° F.; pain.

Complications.—Embolism (p. 282); haemorrhage (p. 563).

Excision of Angiomata (Vascular Tumours) (p. 467).—Performed in cases of cavernous naevus, in plexiform angioma, and in some other naevi which cannot be treated by electrolysis or by carbonic acid snow (p. 745).

Preparation and after-nursing.—See p. 460.

OPERATIONS ON LYMPHATICS AND LYMPHATIC GLANDS

Lymphangioplasty.—An operation in which dilated lymph trunks are implanted into a tributary of the internal saphenous vein; or in the construction of artificial lymphatics, by threading sterilized silk in the subcutaneous tissues and leaving it implanted therein, carrying it up to the normal tissues. Performed in some cases of elephantiasis (p. 229), oedematous arms after amputation of the breast (p. 488), etc.

Preparation for general anaesthesia (p. 446).—Purification of the entire limb (p. 437).

The *usual dressings* are required (p. 40).

Appliances.—Pillows for raising the limb, cradle if a lower limb.

Position.—Recumbent, the limb well elevated on pillows, or may be suspended from a Balkan beam (Plate IX).

Diet.—See p. 789.

Dressing for stitches.—See p. 441.

Nursing.—The limb is usually measured at stated points before the operation and again periodically subsequently, in order to see if the swelling is diminishing. The patient remains in bed until the stitches have been removed, or until it is no longer necessary to keep the limb elevated. Massage (p. 745) may be ordered after the dressing is discontinued.

Complications.—Sepsis (p. 569).

Excision of Lymphangiomata (Lymphatic Tumours).—Performed in cases of lymphangioma. (Preparation and after-nursing, pp. 446 and 460).

Excision of Glands.—An operation performed for the removal of diseased and enlarged glands, adenitis. Undertaken in cases of tuberculous glands (p. 318); lymphadenitis; lympho-sarcoma; and in secondary glands occurring after removal of a cancerous growth (p. 314). Glands may be removed from the neck, the axilla, and the groin. (For glands in the neck see operations on the neck, p. 482.)

Axillary Glands.—*Preparation for general anaesthesia* (p. 446).

Purification (p. 437).—The axilla must be completely shaved (p. 438). Purification should include the arm to the elbow, the chest to the middle line back and front, the neck to the hair line.

Dressings required (p. 40).

Appliances.—Small sand-bag and extension cloth.

Position.—Recumbent. The arm may be kept extended, i.e. the upper arm placed on a small pillow at right angles to the body and kept in position by means of an extension cloth passed around it, the ends fixed beneath a sand-bag.

Glands in the Groin.—*Preparation for general anaesthesia* (p. 446).

Purification (p. 437).—Complete shaving of the genitals is required (p. 438). In women, a vaginal douche may be ordered (p. 72).

The usual dressings.—See p. 40.

Position.—Recumbent. The dressing must be protected from possible infection from the genitalia (p. 443).

Diet.—Extra diet is given in tuberculous cases.

After-dressing.—The wound is dressed the second day if a tube has been inserted (p. 441), or if the dressing has been packed (p. 442). Otherwise the dressing is done on the eighth to the tenth day for the removal of stitches. The patients remain in bed for six to fourteen days.

Unfavourable symptoms.—Continued rise in temperature, pain.

Complications.—Sepsis (p. 569), secondary haemorrhage (p. 564).

OPERATIONS ON NERVES

Primary Suture, for uniting a divided nerve which has only recently been divided, due to an accident.

Secondary Suture, for uniting a divided nerve which has been in this condition for some months and in consequence has become bulbous.

Nerve Grafting (Neuroplasty), to supply nerve which has been lost.

Nerve Anastomosis, undertaken in some cases of paralysis (p. 361) in order to restore movement.

Neurectomy, or excision of part of a nerve trunk.

Sympathetic Ganglionectomy is the removal of certain nerve ganglia, adopted in megacolon, Hirschsprung's disease (p. 607), as a means of relieving spasm and allowing the dilated colon to regain its normal size.

Sympathectomy is the division of sympathetic nerve roots; undertaken in cases of Raynaud's disease, some vasomotor diseases, chilblains, and has been adopted for dysmenorrhoea.

Excision of Neuroma is removal of the growth.

Nerve Stretching consists in making an incision so that the nerve may be reached and stretched. Performed in cases of intractable neuralgia, commonly for sciatica (p. 366).

Preparation and after-nursing are as described on p. 460. In addition the limb must be kept absolutely at rest and maintained in the required position; it may be put up in plaster at the time of operation. Massage may be ordered during convalescence. It is important that these patients should be well fed in order to aid in the restoration of the nerve. Sedatives may be prescribed.

Neurectomy of the Gasserian Ganglion.—Removal of a portion of the gasserian ganglion is undertaken in cases of intractable trigeminal neuralgia. It is always a serious operation and attended with risk. The patient should be under preparatory treatment for several days prior to the operation (p. 460).

Preparation for general anaesthesia (p. 446).—In addition, a hypodermic injection of morphia or other basal narcotic (p. 450) may be ordered, and a rectal saline injection (p. 58).

Purification (p. 437) must include partial shaving of the head (half, or some surgeons have the whole head shaved). Purification of the face and the eye (see Chap. XX, p. 636) on the affected side.

Dressings required.—The usual dressings, in addition six eye pads, sterilized boracic or saline solution for the eye, ribbon gauze (one inch wide) which may be required for swabbing.

Position.—Recumbent with the back to the light. The light should be subdued for the first few days.

Diet.—Liquid for the first two or three days, then soft light food. Nothing that will require much mastication for the first week, then gradually increased to full diet.

Temperature, pulse, and respiration are taken every four hours until normal.

After-dressing.—The wound is dressed on the second day, and then about the fourth day to remove the stitches from the eyelids which are usually stitched together. The eye is washed out with warm boracic lotion (p. 625), and this is repeated about every second day. The eye is kept covered with a pad for at least a fortnight.

Nursing.—These patients as a rule suffer very much from shock, as the operation is a lengthy one, the nurse must therefore have everything in readiness to overcome it (p. 561). Saline is ordered to be given by rectum on return from the operation either with or without the addition of brandy, or a stimulating enema may be ordered (p. 60). Hypodermic injections, both stimulant and sedative, may be ordered before and after the operation (see pp. 450 and 844). The patient must be kept absolutely quiet in a subdued light for the first few days. He is not allowed to help himself in any way until the surgeon gives permission. Post-operative vomiting (p. 457) is often a troublesome condition in these cases. Rectal saline with the addition of glucose or white of egg (p. 60) is given every four hours until the patient can take food by mouth. Plenty of nourishing food of a suitable kind is allowed as soon as the sickness stops, as these patients need to be well fed. The eye requires careful treatment for some time after the wound has healed. The patient is kept in bed for three weeks at least, but allowed to sit up in bed at the end of ten days if all goes well.

Unfavourable symptoms.—Rise of temperature and pulse; pain; headache; persistent vomiting; rigor (p. 207); delirium (p. 359); coma (p. 360).

Complications.—Collapse from shock (p. 561); secondary haemorrhage; septic meningitis (p. 375); ulceration of the cornea (p. 634).

OPERATIONS ON BONES

Osteotomy is the division of a shaft of a bone, or making a section of a bone for the correction of a deformity, and may be undertaken for mal-union of a fracture, arthritis, genu varum, and genu valgum.

Immediate operation and drainage of the medullary cavity may be necessary in acute osteo-myelitis, which is always a serious condition. The symptoms and nursing are fully described on p. 572.

Bone-grafting is the insertion of a portion of healthy bone to repair or replace a defect in a corresponding structure, or for fixation of a joint, e.g. spine in tuberculosis and scoliosis.

Operations for repair of bone may be necessary in fractures, and consist in placing the fractured ends of bone in apposition and retaining them in place by means of screws, plates, pins, or bone graft when part of the fractured bone is missing (see Plate XLIII).

Joints.—Arthrectomy (erasion) is removal of synovia and all diseased tissue. Excision or resection is undertaken when the bone is diseased. Both these operations have now largely been superseded by arthrodesis.

Arthrodesis is the surgical fixation of diseased or paralysed joints. The articular cartilage over the ends of the bones having been removed, the bones will adhere by callus formation, or they may be fixed by screws, pins, or a bone graft.

Arthroplasty consists in inserting a flap of tissue between the articular ends of an ankylosed (fixed) joint.

Preparation is that given on p. 446.

After-dressing.—When the wound has been entirely closed the first dressing is usually for removal of stitches, 10–14 days. When a drainage tube has been inserted the dressing is renewed on the second day or earlier.

Nursing.—The patient is put to bed, but is not necessarily kept lying flat; he may be semi-recumbent, propped up, or allowed to turn provided this does not interfere with the required position of the limb or part operated upon.

Many of these operations on bones and joints are treated by immobilization in plaster from the time of the operation.

An exception is a fracture of the neck of the femur treated by insertion of Smith Petersen's pin (see Plate XXV). These cases are not put up in plaster, but have the usual post-operative dressings. A cradle is necessary over the foot. The stitches are removed about the tenth day, but the patient is allowed to move about the bed, and is encouraged to do so during this period. Active movements of the joints of the leg are then started. The patient remains in bed for 4 weeks, and then gets up and begins walking on crutches, but there is no weight bearing until a further 4 weeks have elapsed, when the crutches are discarded for sticks.

For cases immobilized in plaster the following is a guide, but varies considerably with the nature of the operation performed, the surgeon's particular methods of treatment, and whether the bone operated upon is eventually to function normally, as after a fracture, osteotomy, etc., or is to remain fixed in a particular position, as after arthrectomy, arthrodesis, etc.

Operations undertaken for the repair of fractures are commonly followed by immobilization in plaster for 2–6 months, see details given under fractures (p. 529). Following operations to fix the joint by obtaining bony ankylosis — arthrodesis — the joint is immobilized in plaster for 3–6 months according to the time needed for firm callus formation, which is verified by X-ray.

Limbs encased in plaster require to be well elevated for 48 hours or longer after the operation in order to prevent swelling of the extremities, which causes pain and interferes with the movement of fingers or toes. This may be done by raising the limb on pillows, or in the case of the lower limb it may be raised in a Braun's splint, with the foot of the bed raised on blocks; alternatively, the limb may be suspended from a Balkan beam. Should there be any exudation through the plaster immediately following the operation, the plaster is enveloped in sterile gamgee tissue, and left undisturbed until due for removal for stitches. Pain is often severe for about 10 days following operations on bone, and for its relief drugs will be ordered to be given as required. Morphia may be necessary during the first 48 hours. After removal of the stitches a firmer plaster is applied for walking. The stitches may be removed without changing the plaster by cutting a window over the site of the stitches, and applying another plaster bandage over the replaced window when the stitches have been removed.

The temperature and pulse should be taken every 4 hours, except when asleep, until the stitches have been removed. Any rise in temperature after the first few days accompanied by persistent pain in one area, pointing to possible infection or irritation, is treated by cutting a window over the site for inspection and, if necessary, dressing.

All joints left free require to be moved by the patient frequently, beginning on the second or third day after the operation. Toes or fingers are moved the day following the operation.

The patient may begin getting up after the stitches are out. After operations on the hip joint the patient is usually kept in bed some time longer.

When a lower limb is affected the patient begins walking on crutches a day or two after getting up. A leather boot with rockered sole is worn over the plaster (see Plate XXVI). He is taught to use both legs when walking with crutches, gradually bearing his weight on the affected leg. Later, sticks may be substituted for the crutches, and finally he walks on the plaster without aid. For the first 7–14 days after getting up it is necessary to keep the foot elevated when not actually walking to prevent swelling and pain due to swelling.

Plaster casts are renewed when they become soft and worn out, for a leg about 8–12 weeks. Plasters of the arm last rather longer.

An anaesthetic is administered for the first change of plaster when the stitches are removed, and may be necessary for the second change of plaster, but is not usually required for subsequent renewals.

Complications.—Haemorrhage; sepsis; bone irritation due to screws, pins, or plate which require removal; non-union due to fibrous instead of callous formation; skin irritation due to pressure or friction.

For application and removal of plaster see p. 162.

Removal of Loose Bodies from Joints.—Preparation and nursing, see p. 460.

The limb is not placed on a splint. Passive movements are started at the end of a few days. After removal of the stitches the patient may get up, and is encouraged to move the joint as much as possible. Massage is given and the patient may use the limb after a fortnight.

Amputations of Limbs consist in the removal of the whole or part of a limb, and may be performed either by *disarticulation* (dividing through the joint), or by cutting through the bone. It is always a serious operation, and the larger the part amputated, the more serious it is. It is undertaken when a limb is hopelessly diseased, seriously injured, or for gangrene (p. 573).

Preparation for general anaesthesia (p. 446).—Spinal analgesia (p. 445) is employed in the case of amputation of a lower limb when the patient is suffering from some disease such as diabetes (p. 289) when an anaesthetic would be harmful.

Purification (p. 437) must include the whole limb and well beyond the point of amputation. The limb below the seat of operation should be enveloped in a separate sterilized towel after purification, the dressing being quite apart from the purification dressing over the part to be operated on.

Dressing required.—In addition to the usual dressings, a roll of gauze should be provided for wrapping round the stump.

Appliances.—Sand-bags and extension clothes. Cradle if a lower limb. Tourniquet (p. 566).

After-dressing.—On the second day for removal of the drainage tube, then tenth day for stitches unless the condition of the limb necessitates a daily dressing.

Temperature, pulse, and respiration are taken every four hours until normal, then twice a day.

Nursing.—Care and treatment of the amputated limb should begin from the day of operation in order to prevent deformity and difficulty in fitting the artificial limb. On return to bed after the operation the above-knee and below-knee stump must lie flat on the bed, held down (extended) by means of extension cloth laid over them, and held in place by sand-bags on either side for 3–4 days, or as directed by the surgeon. A back splint is often necessary for a below-knee amputation to prevent flexion of the knee joint. A cradle will be required for leg amputations. All arm amputations may rest comfortably in any suitable position.

It is advisable during the first 48 hours to arrange the bedclothes in such a way that the stump dressing is easily inspected without disturbing the patient. During this time inspection of the dressing is required every ½ hour for any sign of haemorrhage. If this occurs the surgeon should be immediately informed, and, if serious, digital pressure applied to the proper pressure point may be required, or even a tourniquet. A tourniquet is kept in readiness on the bed rail. See digital pressure, p. 566.

Some degree of shock is present after every amputation, which is treated as described on p. 561. Special care is needed to avoid contamination of the bandage and dressings (see protection of dressings, p. 443).

Oedema always occurs when tissues are damaged either surgically or traumatically. The reduction of oedema can be greatly speeded up by the correct application of a crêpe bandage to all amputation stumps after the stitches have been removed. In above-knee stumps it is imperative to use bandages 6 inches wide, stitching two bandages end to end before rolling to form one long bandage. The bandage needs to be rolled firmly before application, otherwise it cannot be applied with sufficient tension over the oedematous tissues. Diagrams 4–11 on p. 755 illustrate the correct method of bandaging for an above-knee stump.

A below-knee stump requires a 4-inch bandage, and all arm stumps require bandages 3 inches wide. No other width of bandage should be applied for these stumps.

Bandages are removed, wound up firmly, and re-applied 3 to 4 times a day so that each new application assists to retain and further reduce the shrinkage which the bandage is producing.

Stump musculature loses its tone after amputation and joints are apt to become stiff. In leg amputations gentle exercise may be given a few days after the operation, encouraging the movements of the hip and knee joints to a very small degree. These movements are increased gradually until it will be found that the patient can fully flex and extend all joints by the time the stitches are to be removed. Thus the muscular tone and full mobility of the joints is restored. The muscles must not at any time be tired, and if nerve pains are felt the degree of movement is reduced.

When the wound is healed, which will be about 3 days after the stitches have been removed, the exercises described on p. 756 are given. After arm amputations, the patient is encouraged to exercise the musculature and joints from a few days after the operation. Massage is not given to any amputation stump. It does not reduce the oedema, but it does irritate the nerve endings, causing subsequent pains and very often phantom limbs.

The correct application of the crêpe bandage, together with a full description of exercises, will be found on pp. 755, 756.

Stitches are removed about the tenth day. The patient remains in bed 14–21 days, or longer if the wound does not heal by first intention.

Unfavourable symptoms.—Rise of temperature and pulse, or sub-normal temperature below 97° F., dyspnoea, cyanosis.

Complications.—Haemorrhage, primary or secondary; sepsis; embolism; oedema; contracture of stump.

For the instruments used for amputation see Plate XVII.

Operations on the Brain and Cranium

Trephining consists in the removal of a piece of bone from the skull; it is performed in the following conditions: As a preliminary operation to the removal of a cerebral tumour, or opening a cerebral abscess (p. 379); to relieve tension (decompression), in cases of inoperable tumours of the brain; to relieve compression, as in a depressed fracture of the skull (p. 527). Tumours may be removed from the brain. Abscesses may be evacuated. Blood-clot may be removed after severe haemorrhage (p. 533).

Preparation for general anaesthesia (p. 446).

Purification.—The whole head is shaved (p. 438) and purified.

Dressings required.—The usual dressings are needed (p. 40). A triangular bandage or a double-headed roller (p. 129) will be necessary.

Position.—Recumbent, one pillow is allowed. The bed should be placed back to the light.

Temperature, pulse, and respiration are taken every two or four hours. Two charts may be necessary, one for either side of the body, the temperature being taken in the axillae.

Diet.—Liquid diet consisting of milk and water, imperial drink (p. 820), albumin water, glucose drinks, barley water, for the first week or longer, then gradually increasing to light solid diet. No stimulating drinks are given, such as tea or coffee, without orders.

After-dressing.—The wound is dressed on the second day. Stitches are removed about the tenth day. The dressing may not require changing in between unless there is a discharge of cerebrospinal fluid.

Nursing.—Diet: If the patient is drowsy he is fed by nasal tube (see p. 55), when able to take fluids he should first try by sucking fluid from a swab, and, if the act of swallowing is effectual, he may be spoon fed, provided each spoonful is swallowed before another is given.

A good light is necessary for the special care and attention these patients require, but the bed should be so arranged that no light falls directly on the patient's face and that he is not facing a window or other light. If the head of the bedstead is not removable it is well to turn the bedstead so that the patient lies with his head at the foot, this, for two reasons: it is more convenient for dressing and attending to the head, and if the patient becomes restless he cannot injure his head against the rails. For bed-making the patient is carefully turned on his side. Unconscious patients should be turned from side to side every few hours. When turning the patient, first flex his knees, drawing them to the side towards which the patient is to be turned, then draw the arm on that side away from the patient, and the opposite arm bring right across the chest, so that the weight of the limbs is already taking some share in turning the patient over, very little effort is then needed to turn the patient. When conscious, the patient is kept absolutely quiet and not allowed to sit up or help himself in any way until the surgeon gives permission. The room or ward should never be left without a nurse in sight of the bed. Salivation may occur and subject the patient to the risk of aspiration pneumonia (p. 254). Swabbing aggravates the salivation and a suction apparatus is desirable; if unobtainable, or unsuccessful, the foot of the bed is raised on blocks allowing the saliva to dribble out, which is better than sitting the patient up.

The temperature is taken every two hours, if it rises to 103° F. the bedclothes are reduced, if it still rises, tepid sponging (p. 111) is given. The pulse is taken hourly or oftener at the commencement.

If conscious an aperient is usually prescribed the second night, followed by a simple enema if necessary. The urine requires measurement. If retention is present a catheter will probably be needed. Incontinence of faeces and urine may occur. The back and any parts that may suffer from pressure need to receive special care, as these cases are very prone to bedsores (p. 363). The scalp cannot be brushed, so should be cleaned with 70 per cent alcohol to remove dandruff.

Fits may occur and require intelligent observation and attention from the nurse (see fits, p. 362). Complications may occur at any time after the operation, so that constant vigilance is needed until the patient is discharged. Nothing that could cause any harm should be left within reach of the patient in case delirium should supervene. (For nursing of nervous diseases see p. 357.) Any loss of power in the limbs should be noted, also squint, conjugate deviation of the eyes (p. 209), or any spasm, contractions, rigidity, or flaccidity. (For descriptions of symptoms see Chapter V.) The length of time the patient remains in bed is very variable. Favourable cases are allowed to sit up in bed at the end of a fortnight, and allowed out of bed at the end of three to four weeks.

Unfavourable symptoms.—Temperature above 100° F. or below 97° F. Pulse above 100 or below 60. Respiration above 26 or below 12. Cheyne-Stokes respiration (p. 206), rigors (p. 207), urgent or forcible vomiting (p. 180), furred tongue with offensive breath, incontinence of faeces or urine, squint, conjugate deviation (p. 209), fits (p. 362), delirium, coma.

Complications.—Shock (p. 561), haemorrhage (p. 563), sepsis (p. 569), meningitis (p. 374), bedsores (p. 363), pneumonia (p. 251).

Preliminary Trephining is a comparatively simple operation. The preparation will include shaving the head (p. 438). The after-treatment is that described on p. 460.

OPERATIONS ON THE MOUTH, LIPS, AND JAWS

Mouth.—Extraction of Teeth.—*Preparation* for nitrous oxide gas or regional anaesthesia (p. 444). General anaesthesia is not employed unless a large number of teeth have to be extracted.

Purification consists in cleansing the teeth and mouth with an antiseptic mouth wash (p. 15).

Nursing.—The patient is not confined to bed unless a general anaesthetic has been administered. Frequent, plentiful mouth washes are used either hot or cold according to instructions. An aperient is given within 24 hours. Soft food is necessary for a day or two if several teeth have been extracted. When all the teeth have been extracted the food requires to be minced. The head should be well elevated until all fear of haemorrhage is over. (For treatment of haemorrhage see p. 564.)

Operations are performed to remove Dental Cysts and Epulis (a fibrous tumour springing from the wall of the alveolus). Excision of growths on the lip may be performed for epithelioma (p. 315), mucous cysts (p. 467), naevi, or warty growths. Repair of hare-lip and cleft palate, p. 608.

Preparation for general anaesthesia (p. 446).

Purification consists in the careful cleansing of the mouth and teeth with a tooth brush and antiseptic mouth washes (p. 15).

Diet.—Liquids or soft solids, such as bread and milk, are given until the bleeding has ceased. All foods should be cold for the first 48 hours.

After-dressing.—Frequently no dressing is applied, but if so, it will probably need changing each time the patient has food. Stitches are removed about the eighth day.

Nursing.—The patient is not confined to bed beyond a day or two unless the operation has been an extensive one, as for the removal of the entire lip. The mouth is syringed before and after food with an antiseptic lotion. It may be necessary to use a feeder with a rubber tube attached (p. 55) for administering food. In severe cases rectal feeding may be ordered (p. 60). Talking or laughing should not be allowed if a large portion of the lip has been removed, otherwise the stitches may give way. An aperient is given within 24 hours.

Complications.—Sepsis (p. 569), haemorrhage (p. 563), oedema of the glottis (p. 668), erysipelas (p. 581).

Operations for Necrosis of the Jaw which may be caused by an alveolar abscess, traumatism, tubercle (p. 318), syphilis (p. 322), or some debilitating illness. The preparation is that described above with the addition of external purification of the jaw (p. 437). The after-treatment is that described above.

Excision of the Jaw; Excision of the Tongue.—These operations are performed for malignant disease (p. 314).

Preparation for general anaesthesia (p. 446).

Purification must include a thorough cleansing of the mouth and teeth together with the external purification (p. 437). The neck will require purification if a tracheotomy is to be performed.

Dressings required.—In addition to the usual dressings those needed for a tracheotomy must be prepared (p. 662), a four-tailed jaw bandage (p. 144) should be provided in addition to roller bandages of suitable width. Tracheotomy instruments, tubes, etc., must be in readiness in every case.

Position.—After the effects of the anaesthetic have passed off the patient is propped up in bed with several pillows and turned on to his side.

Diet.—Rectal feeding (p. 60) is ordered for the first few days. A saline injection (p. 58) is given on return from the operation. After three to five days the patient may be allowed to take food by mouth by means of a spouted feeder with a soft rubber tube attached (p. 55), or if this is not allowed oesophageal feeding (p. 54) may be ordered. Nourishing liquid diet consisting of eggs, glucose drinks, milk, Benger's food, etc. is given, every two hours if a feeder is used, or one pint every four hours if oesophageal feeding is ordered; stimulants are commonly ordered. As the mouth heals, soft food is allowed, everything being mashed or minced. An aperient is usually given at the end of 24 to 48 hours.

After-dressing.—The mouth is syringed before and after food, the wound is then re-dressed. During the first 48 hours constant swabbing of the mouth is necessary to keep it clean and free from mucus and blood-clot; great gentleness and care are necessary, as it is extremely painful and rough handling may cause haemorrhage.

Temperature, pulse, and respiration are taken every four hours for the first week or until normal.

Nursing.—These patients require constant watching and good nursing. The nurse must not leave the bedside at all until all fear of haemorrhage is past and the surgeon has given his consent, for this reason special nurses are required for the first week or 10 days. Special care is needed in the avoidance of draughts and cold, as these patients are particularly liable to chest complications. Some surgeons order a half tent to be used, or screens may be made to answer the purpose. If part of the tongue has been removed the nurse needs to be on the alert in case the remainder should drop back whilst the patient is sleeping and obstruct respiration. A silk suture is usually left attached, so that in the event of this happening the nurse may draw the tongue forward and hold it if necessary. The mouth requires to be kept free from clot, mucus, or particles of food and discharge, otherwise aspiration pneumonia (p. 254), which is often preventable with good nursing, may result. Talking is a great difficulty to the patient to start with; the nurse should, therefore, anticipate all his wants and provide a writing-tablet and pencil which can be used if she fails to understand him, or if he needs to say anything requiring many words. Great watchfulness is needed throughout, even though the patient appears to be convalescent. Cases have been known to die of haemorrhage a fortnight after the operation when they appeared to be progressing favourably. The nurse must make quite sure of how she is to act in the event of haemorrhage occurring, taking her instructions from the surgeon beforehand. (For method of compressing arteries for haemorrhage see p. 566.) The length of time the patients are confined to bed varies. Some surgeons allow them to sit out of bed in an arm-chair about the fourth day, but they still require the same watchfulness and care. Other surgeons keep the patient in bed for ten days or longer.

Unfavourable symptoms.—Rise of temperature, pulse, and respiration. Dyspnoea, cough, offensive breath, swelling about the neck.

Complications.—Shock (p. 561), primary and secondary haemorrhage (p. 563), aspiration pneumonia (p. 254), bronchitis (p. 248), oedema of the glottis (p. 668), sepsis (p. 569), erysipelas (p. 581). Should a tracheotomy tube be left in after the operation, the nursing given under tracheotomy (p. 662) will be necessary.

Hare-lip, Cleft Palate.—See Chapter XVIII, p. 608.

OPERATIONS ON THE NECK

Thyroidectomy or partial thryoidectomy may be performed for exophthalmic goitre (p. 297), toxic adenoma (p. 467), and colloid goitre. The operation may be completed in one operation or may be undertaken in stages. It is entirely a matter of surgical judgment as to the amount of gland to be removed at one time. The life of a patient suffering severely from thyrotoxicosis may be lost as a result of removing too much of the gland at one time. It is well known though inexplicable that a patient with only one-eighth of the gland remaining can die of acute thyroid intoxication, whereas, if the arteries are ligatured, or only a portion of gland removed at the first operation, in spite of the fact that the thyroid tissue is not appreciably diminished, the patient is likely to live to have the operation completed a few days later. Preliminary medical treatment has rendered the necessity for multiple stage operations less frequent. Though great improvement may follow hemi-thyroidectomy about seven-eighths of the gland may have to be removed before the full benefit of surgical treatment is attained.

Pre-operative treatment.—Success of the operation depends largely on adequate preparation, which is given in a medical ward, and includes rest, mental and physical, and is necessary because during rest metabolism is diminished, and the damaged heart muscle can recover its tone to a certain extent. Anxiety robs the patient of the benefit of rest, and in order to ensure mental as well as physical rest, bromides and luminal are prescribed.

Administration of fluids is important, the patient drinking five pints of fluid daily.

Drugs.—In seventy-five per cent of toxic goitre cases a course of Lugol's solution of iodine in milk before operation is one of the most potent factors of ensuring the patient's safety. A dose of five minims thrice daily for three or four days, increased to ten minims thrice daily for three or four days preceding the operation, is given, thirty minims is given two hours before the operation. During the resting period tests are made. The basal metabolic rate is tested (p. 125) at frequent intervals, the operation being undertaken when the B.M.R. has reached the lowest to which it can reasonably be expected to fall. The 'electrical threshold stimulus' is tested; if only a small stimulus is necessary there is danger of post-operative tetany (p. 300), and to avoid this, calcium gluconate given by mouth is ordered for a few days. The 'serum calcium' is estimated and any deficiency rectified by giving calcium gluconate and parathormone.

An ' electrocardiogram ' is taken to see if there are any pathological changes in the heart muscle in cases of colloid goitre and large adenomata. The chest may also be X-rayed to see if there is any deviation of the trachea.

A four-hourly chart is kept. The weight is recorded twice a week, persistent loss of weight is important, and a serious symptom (see p. 298). The urine is tested as glycosuria may be present, due to faulty metabolism, and is treated with insulin (p. 290). Thyroidectomy for toxic goitre differs from almost all other operations in that the patient tends to become warmer, since the metabolism is further stimulated thereby. The hottest time of the day should be avoided for the operation, the theatre kept as cool as possible, the patient only lightly clad. Syrup of senna ʒvj is given the night before operation, followed by a simple enema in the morning, or the aperient may be omitted giving only the enema. Morphia, one-sixth of a grain, is given to keep the patient resting during the night, and may be repeated in the morning, or given an hour before the patient is taken to the theatre. A light breakfast is allowed if the operation is to take place in the afternoon. If the patient is extremely apprehensive he is not told when the operation is to take place, a rectal saline given one or two mornings preceding the operation will prevent him thinking the rectal injection of avertin has anything to do with the operation.

Post-operative treatment.—The principal requirements are that the patient should be kept cool, that fluids should be given in abundance, that sedatives should be administered in sufficient quantity, and that, in toxic goitre, iodine medication should be continued at least until the patient is ready to go home. Directly the patient returns to the ward a rectal saline containing Lugol's solution, thirty minims, is given by rectum. As soon as the patient regains consciousness he is propped up in an upright position, and given morphia or heroin if restless, which may be repeated four-hourly if necessary. A rise in temperature is usual after operation for toxic goitre, and the body must, therefore, be given every opportunity of losing heat. The room should be cool, airy, an electric fan is a boon, the bedclothes light, and a cradle is useful in keeping the feet and legs cool.

Only if vomiting persists is it necessary to give salines by the rectum, as the mental upset caused by the injection outweighs the advantage. Pulse and respiration need to be recorded every half-hour for twelve hours. Respiration may become very slow; if it drops to 12 a minute, oxygen and carbon dioxide are administered until the rate increases to 18 per minute. It is important to get the patient to swallow a drink of water, and to speak as soon as he becomes conscious, in order that he may realize that the operation has not injured his throat. The patient is allowed up on a couch on the third or fourth day, after the Michel clips have been removed.

Dressings.—Bulky dressings are avoided, and after the first 48 hours the light gauze and wool dressing may be replaced by gauze secured by tape round the neck. A Keith's tube (Fig. 185) may be inserted in the middle of the wound and removed in 24 hours, or a corrugated rubber drain either end of the wound, removed in 48 hours. Michel's clips are used and removed on the third or fourth day, a gauze sponge is then fixed in position with Elastoplast.

Complications.—Acute thyrotoxicosis, or post-operative thyroid crisis, may occur, and is the most dangerous of all complications; it is caused by the removal of too much of the gland at one time, following inadequate pre-operative preparation. The temperature rises to 102–104° F., the pulse is rapid, dyspnoea, restlessness, and excitability are present. The only treatment of use is sufficient morphia, and large quantities of fluids; continuous intravenous saline is essential. The patient is kept cool with ice and a fan. Reactionary haemorrhage may occur, and is controlled with morphia. Sepsis is rare, slight inflammation, with an effusion of blood and serum, sometimes occurs and is treated with boracic fomentations.

Tetany is uncommon but may occur if the parathyroid glands are damaged, or the blood calcium content is too low, calcium gluconate and parathormone are given (see treatment, p. 300). Aphonia follows injury to the laryngeal nerve, paralysis of the vocal chords may cause anxiety: stridor and dysphagia are present. Tracheotomy requisites should be ready near the bedside. Mania is rare and is usually controlled by bromides. Shock is uncommon when the patient has been properly prepared and the operation uncomplicated, if present it is treated by the usual methods (see p. 561).

Excision of glands may be undertaken for the removal of tubercular glands, lympho-sarcoma, and adenitis.

Preparation for general anaesthetic (see p. 446).

Appliances.—In addition to the usual instruments, tracheotomy instruments and tubes need to be in readiness. In the bed two small sand-bags and a retention cloth.

Pre-operative dressing (see p. 437).—Any hair extending to within two inches of the operation area should be shaved. Long hair is plaited on the top of the head away from the side to be operated on, and covered with a sterile cap when the pre-operative dressing is removed.

Position.—Usually recumbent, the head steadied by sand-bags, and retention cloth.

Nursing.—On return from the theatre the dressing needs to be adequately protected from outward contamination (see p. 443). It is advisable to steady the head between sand-bags for 5 or 6 days in order that the wound may heal with as little scar as possible.

After-dressing.—At the end of 24 hours, for removal of the drainage tube if one has been inserted. Clips or stitches removed fifth to eighth day. Diet is as usual.

Unfavourable symptoms.—Rise of temperature and pulse.

Complications.—Haemorrhage (see p. 563), sepsis (see p. 569), post-operative vomiting (see p. 457).

Operations on the Lungs

Pneumotomy, incision of the lung, performed in cases of abscess (p. 262), hydatid cyst (p. 227), and gangrene of the lung.

Pneumectomy (Pneumonectomy), excision of a portion, or the whole lung, performed when the lung has become strangled through a small opening and cannot be returned, in malignant disease of the rib, or for bronchiectasis (p. 249).

Lobectomy, excision of a lobe of the lung, performed in bronchiectasis.

Opening and draining the pleural cavity is performed in cases of **empyema** (p. 264), resection of rib is usually necessary.

Thoracoplasty, phrenic evulsion, and **artificial pneumothorax** (see surgical treatment of phthisis, p. 258).

Pre-operative treatment.—The patient is admitted ten to fourteen days prior to the operation; during this time the patient's general condition and powers of resistance are built up by a liberal nourishing diet with the addition of malt extract and halibut oil. The patient is nursed out of doors or on a balcony. The condition of the affected lung is improved by breathing exercises and postural drainage at least once a day, a high bed-block is also used. Massage is given. The sputum is measured twice a day.

Pre-operative dressing.—After shaving the axilla and chest, the skin is purified and a sterile compress applied to cover the chest, back and front, from waist to shoulders.

Preparation for anaesthesia.—An enema is given the morning of the operation. The usual anaesthetics are omnopon, ⅔ grain and scopolamine, $\frac{1}{150}$ grain, followed by a spinal anaesthetic. During the operation coramine may be given, also injections of morphia, $\frac{1}{6}$ grain, to lessen coughing.

Post-operative treatment.—Immediate post-operative treatment consists of respiratory stimulants such as coramine, warmth to combat shock, fluid in the form of either intravenous blood or saline. The foot of the bed is raised on blocks. An oxygen tent (p. 108) is erected as soon as possible if it is found to be necessary. Until the effects of the anaesthetic have worn off the patient lies in a semi-recumbent position, his back well supported by pillows so that no strain is put on the drainage tube.

Rest is of the greatest importance, and for this reason only the essentials of toilet are performed during the days immediately following the operation.

Lack of oxygen may be acutely felt by the patient, and this is noted by a marked increase in the rate of respirations and cyanosis. When recovered from the anaesthetic the patient may lie in whichever position he finds most comfortable; he is well supported by pillows and inclined towards the affected side to assist drainage; a niche is made in the pillows for the tube draining into a receptacle at the bedside.

An enema is given on the third morning if his condition is satisfactory, otherwise it is delayed until later.

The patient is encouraged to drink abundant fluids; the rest of his diet may be according to his wishes.

Injections of morphia are avoided, but other drugs or morphia substitutes are given when necessary.

Dressing.—The wound is dressed daily, the tube being removed and replaced each time. Drainage takes place into a receptacle at the side of the bed, and care must be taken to see that the end of the tube is immersed in a harmless antiseptic—Dakin's solution. As the patient breathes, suction causes the fluid to run up the drainage tube with each inspiration; thus a continual rise and fall of fluid may be seen in the tube and this is a valuable means of ascertaining whether the end of the tube inside the lung cavity has slipped out, the presence of a bronchial fistula, or if the tube is blocked. The tube is shortened at intervals as the amount of discharge decreases until finally the wound drains into the dressing. The discharge is measured daily. Periodic X-ray examination shows how the site of operation is progressing. After a pneumectomy a phrenic evulsion (p. 259) is performed to help obliterate the cavity by paralysing the diaphragm. Massage and breathing exercises are given later, also artificial sunlight.

Unfavourable symptoms.—Sudden rise or fall in temperature.

Rapid, or feeble and irregular pulse, dyspnoea, cyanosis, or pallor.

Complications.—Shock, embolism, haemorrhage (haemoptysis), septicaemia, sudden heart failure.

OPERATIONS ON THE HEART

Cardiolysis.—Resection of the ribs and sternum over the pericardium to free the latter from its adhesions to the anterior chest wall in adhesive mediastino-pericarditis.

Incising and draining the pericardium is performed in cases of suppurative pericarditis.

Cardio-Omentopexy is undertaken for the relief and cure of angina pectoris (p. 276). A graft of omentum is brought up through the diaphragm and stitched on to the inner coat of the pericardium to provide the heart with a new blood supply.

Period of investigation.—Before the operation of cardio-omentopexy is undertaken the patient is under observation for some time. During this time he is allowed up for some hours each day. If worried or excitable, luminal is prescribed twice a day and chloral and bromide at night, if sleepless. The diet is regulated, carbohydrates are reduced if the patient is obese.

Preparation for general anaesthesia.—A mild aperient is given for two consecutive nights prior to the operation followed by a simple enema on the morning of operation.

Purification.—The whole of the chest and back down to the level of the umbilicus is shaved and cleansed with ether soap and methylated spirit.

Basal narcotics.—One and a quarter hours before the operation is to take place a hypodermic injection of scopolamine, $\frac{1}{150}$ grain, with omnopon, $\frac{2}{3}$ grain, is given, followed in half an hour by nembutal, $\frac{1}{111}$ grain, which is repeated in another half-hour just before the patient is taken to the theatre.

Dressings.—The usual dressings are required.

Nursing.—On return to bed the patient is laid flat until he regains consciousness when he is gradually raised during the next 12 hours into the upright position. The left arm is supported on a pillow and kept at rest. Oxygen and carbon dioxide are administered if there is any slowing of the respiration (see p. 456). Continuous rectal saline is given until the patient is able to take fluids by mouth. Morphia is ordered for pain and if there is any tendency to bronchitis, atropin is given with the morphia to check the secretions. When fully conscious, glucose drinks are given, the diet being liquid for the first three days then gradually increased to full diet. At the end of two weeks massage to the legs is given, and the patient is encouraged to move about in bed, increasing his movements each day. Breathing exercises may be ordered from this time, also blowing water from one Wolff's bottle to another for five minutes.

Stitches are removed on the fifth and seventh days.

A mild aperient or enema is given on the third morning, after which solid diet is gradually introduced. The temperature, pulse, and respirations are recorded hourly for the first 12 hours and then four-hourly. Serial electro-cardiograms are taken at the end of the first week. The patient is allowed to sit out of a bed four weeks after the operation. Care is taken to avoid fatigue and a careful watch is necessary on the pulse during the first attempts at activation.

Complications.—Bronchitis, pneumonia. Attacks of angina. Embolism, haemorrhage, sudden heart failure.

Unfavourable symptoms.—Sudden rise or fall in temperature, rapid, or feeble and irregular pulse, dyspnoea, cyanosis or pallor.

OPERATIONS ON THE BREAST

Amputation, or excision, of the breast is performed in cases of malignant disease of the breast, and may be undertaken for benign tumours.

Preparation for general anaesthesia (p. 446).—In addition a rectal saline may be ordered, also hypodermic injection of morphia and atropine (p. 450).

Purification must include shaving the axilla (p. 438), the area purified extending from the nipple on the sound side to behind the scapula, from the hair line in the neck to the waist, the arm to below the elbow. (For purification see p. 437.)

The usual *dressings* are required (p. 40). A large quantity of dressing must be provided and wide roller bandages, width 4½ in.

Appliances.—Small pillow for the arm, sand-bag.

Position.—Varies. The patient is placed in the semi-recumbent position when recovered from shock. The arm is either left down at the side, placed in a sling, or placed at right angles to the body supported on a small pillow and kept in position by an extension cloth passed around the upper arm, the ends being secured underneath a sand-bag.

After-dressing.—On the second day for removal of the drainage tube (p. 440); fourth to fifth days for removal of tension stitches; tenth day for the removal of the remaining stitches.

Nursing.—Collapse from shock may be severe for the first few hours. Rectal saline or stimulating enemata (p. 60) are commonly ordered, also stimulating hypodermic injections. Warmth is necessary, but once the patient becomes warm care should be taken to reduce the hot bottles, etc., otherwise the patient may feel faint from overheating. The dressing usually requires packing (p. 442) within the first four hours, and again later. Patients treated with the arm to the side have it gently moved in all directions after the second day, or according to instructions. After removal of the stitches the patient is encouraged to move the arm in the direction of the head touching the back of her head unless there is a wound with loss of skin. Usually allowed to get up between the fifth and tenth day.

Unfavourable symptoms.—Temperature below 96° F. or above 100° F., rapid feeble pulse, pain in the chest, dyspnoea.

Complications.—Shock (p. 561), pleurisy (p. 262), bronchitis (p. 248), embolism (p. 282), haemorrhage (p. 563), oedema of arm (p. 190).

Amputation of the Breast for Non-malignant Tumours is a much less extensive or serious operation. The preparation and after-treatment are as described on p. 460.

Removal of Cysts and adenomata are slight operations. (For description and treatment see benign tumours, p. 467.)

Abscess of the Breast (mammary abscess) most commonly occurs with lactation (p. 713). (For after-nursing of operation see suppuration, p. 569.)

OPERATIONS ON THE KIDNEY

1. **Nephrorrhaphy,** or **Nephropexy,** consists in fixing a movable kidney.

2. **Nephrotomy** is incising the kidney, undertaken for the removal of stones, cysts, etc.

3. **Nephrostomy** consists in incising and draining the kidney, performed in cases of abscess (p. 518), pyelitis (p. 240), etc.

4. **Nephrolithotomy** is opening the kidney for the removal of calculi (p. 244).

5. **Nephrectomy,** excision of the kidney, undertaken in cases of tuberculous (p. 318) or malignant (p. 314) disease of the kidney. Nephrectomy may be performed through the abdomen (see abdominal operations, p. 499) or by lumbar incision.

Preparation for general anaesthesia (p. 446).

Purification (p. 437).—The area purified must extend from the middle line in front to the spine, and from the axilla (which need not be shaved) to a line level with the anterior superior spine (hip bone).

The usual *dressings* are required (p. 40).

Appliances.—A water pillow, or sponge rubber pillow, is desirable (p. 23).

After-dressing.—On the second day if a drainage tube has been inserted, or the dressings may be changed at the end of 24 hours or earlier in cases in which urine is draining through the wound. When the wound has been completely closed, as after nephropexy, the dressing is not changed until the stitches are removed on the tenth day. In nephrostomy cases, the dressing is changed as required or every four hours according to the amount of discharge present.

Temperature, pulse, and respiration are taken every four hours until normal, with the exception of nephropexy operations, when twice a day is sufficient.

Diet.—Milk, barley water, lemonade, imperial drink (p. 820) are given until the temperature is normal, then light diet with plenty of milky foods and barley water. Tea, coffee, and meat should not be given without the surgeon's orders, except in cases of nephropexy, when ordinary diet may be given all through.

Nursing.—The patient is kept in the semi-recumbent position, two or more pillows being allowed, except in cases of nephropexy, when the patient maintains the recumbent position and is not allowed to turn for three weeks or a month unless otherwise ordered. In cases that are draining (nephrostomy) great care is needed in order to prevent bedsores (p. 17). The back needs to be washed and rubbed each time the dressing is changed. It is advisable to smear the skin with zinc ointment if the dressing gets very soaked. These patients are allowed to turn on their sides if desired or they may be propped on to the affected side if it is necessary to assist drainage. The urine needs careful measurement and a daily specimen should be prepared for the surgeon to see. The bowels require to be kept freely open. The patient is confined to bed for a fortnight or three weeks, or until the wound has healed. Cases of nephropexy remain in bed six weeks, they are usually allowed to sit up in bed at the end of a month.

Unfavourable symptoms.—Rise of temperature and pulse, persistent vomiting, rigors, diminished quantity of urine passed if none is escaping from the wound, haematuria (p. 237), headache, drowsiness, fits.

Complications.—Haemorrhage (p. 563), suppression of urine (p. 237), uraemia (p. 238). (For abdominal operations see Chapter XV.)

OPERATIONS ON THE SPINE

Laminectomy is the removal of the laminae and spinous processes of one or more vertebrae, performed for removal of tumours and diseased bone; to open and drain an abscess; after injury, to relieve pressure; and as a preliminary to operations on the spinal cord.

Rhizotomy.—Rhizotomy, division of the posterior roots of a nerve, may be undertaken for intractable neuralgia (p. 388), visceral crisis (p. 372), certain spastic deformities, Little's disease (p. 608). It may be performed in two stages, viz. laminectomy, followed by division of the nerve roots. **Sympothectomy**, see p. 471.

Bone Grafting (p. 473) to fix diseased vertebrae is employed for deformities due to arthritis, scoliosis.

Tapping, or Aspirating, is performed in cases of spinal abscess, or the abscess may be incised and drained.

Preparation for general anaesthesia.—See p. 446.

Purification.—See p. 437. Dressings see p. 40.

After dressing.—On the tenth to fourteenth day for the removal of stitches. If a drainage tube is in use, the dressing will be changed on the second day.

Temperature, pulse, and respiration are taken every four hours, until normal, then twice a day.

Nursing.—The modern method is by the use of a posterior plaster bed, or shell (p. 180). An anterior shell is also made and may be used during the operation, and subsequently at any time it is necessary to expose the patient's back. When turning the patient on to his face the anterior shell is placed in position, the patient being rolled over whilst encased in both shells, thereby avoiding any movement of the spine. An alternative to the shell is a reversible spinal bed; or a plaster jacket (p. 176) may be applied at the time of the operation.

When these cases are nursed without plaster, very careful nursing is a necessity, as careless moving of a cervical spinal case may prove fatal. When turning the patient for the dressing, etc., two nurses should roll the patient *en bloc* (p. 29), otherwise the spine may be twisted. Bedsores are liable to form unless attention is given to their prevention (p. 17). The skin, bladder, and bowels need particular care. Enemata may be ordered. The urine requires measurement; if retention is present or if the patient is unable to empty the bladder completely catheterization may be ordered (p. 66). A specimen should be tested daily or twice a week. (For urine testing, p. 35.) Cystitis may be due to infection from residuary urine owing to the patient being unable to empty the bladder (p. 245).

Unfavourable symptoms.—Incontinence of faeces or urine, loss of power in any limb, headache, vomiting, rise of temperature and pulse, rigor (p. 207), delirium (p. 359), coma (p. 360).

Complications.—Sepsis (p. 569), meningitis (p. 374), cystitis (p. 245), bedsores (p. 17), paralysis (p. 361).

OPERATIONS ON THE BLADDER, PROSTATE, TESTIS, SCROTUM, AND PENIS

Cystoscopy, or examination of the bladder by cystoscope.

Ureteric Catheterization is employed to obtain a specimen of urine from each kidney separately, required for diagnostic purposes, or to inject fluid into the pelvis of a kidney (see pyelography, p. 724). In addition to the cystoscope, ureteric catheters (Fig. 25) are required.

The patient is not usually given an anaesthetic, but it is advisable to have him prepared (p. 446) in case it is found to be necessary. Immediately before the examination the bladder is washed out, leaving ½ pint of clear water or boracic lotion in the bladder (p. 70). No dressings are required beyond a few swabs, sterilized glycerine, and the apparatus for the bladder lavage (see bladder wash-out, p. 70).

Supra-pubic Cystotomy consists in making an incision into the bladder for either the removal of stone, growths, or foreign bodies, or for draining the bladder.

Perineal Cystotomy.—An opening into the bladder made through the perinaeum.

Prostatectomy is the removal of the prostate, performed in cases of hypertrophy, or in some cases of malignant disease of the prostate. The following is the preparation and after-nursing necessary for all cases of cystotomy:

Preparation as for general anaesthesia (p. 446). But as many of these patients are feeble old men whose kidneys have been damaged by prolonged back pressure, it is advisable that the patient should be under treatment for several days before the operation in order to build up his strength, and to allow investigations of the urinary tract to be made, i.e. blood urea test (p. 128), urea concentration and clearance tests, cystoscopy (p. 492), pyelography (p. 724), and possibly other X-ray examinations. Sometimes the operation is done in two stages, first a supra-pubic cystotomy followed about ten days later by the prostatectomy. If the operation is to be completed in one day the bladder should be drained by an indwelling catheter for two or three days before operation and if there is much cystitis the bladder should be washed out (p. 70) daily and the patient should take 10 grains Hexamine every six hours.

Purification (p. 437) will include washing out the bladder.

Dressings required.—Gauze, wool, many-tailed and T-bandages.

Appliances.—Bladder wash-out apparatus (p. 70), Irving's, or other suitable apparatus is used. Water or sponge rubber pillow (p. 23).

Position.—Semi-recumbent (p. 27); several pillows are allowed when the patient recovers from the anaesthetic. Old men should not be kept flat longer than absolutely necessary, as they are very liable to hypostatic congestion of the lung (p. 257).

After-dressing.—A tube is generally left in the supra-pubic wound for the first few days and the wound can be dressed (*a*) by simple antiseptic dressing with ample cellulose tissue to absorb the urine, changed every four hours or when required (*b*) by Irving's box or other supra-pubic appliance, which draws the urine into a bottle fastened to the bed (Plate XIX).

It is not usual to leave a catheter *in situ*, but if there is much cystitis the bladder may be washed out through the supra-pubic wound every day with permanganate of potash (1–2000) or other suitable antiseptic (p. 70).

Temperature, pulse, and respiration are taken every four hours until normal, then twice a day.

Diet.—Liquid or semi-solid diet is administered every two hours. Milk, barley water, glucose, imperial drink (p. 820), lemonade are given to commence with, increasing to light diet, with fish when the temperature is normal. Stimulants may be necessary.

Nursing.—Great care is needed if the urine is draining into the dressing. The back needs to be washed and attended to each time the wound is dressed (see prevention of bedsores, p. 17). These patients are kept very warm and protected from draughts, as they are particularly liable to chest complications. They are encouraged to move themselves about in bed and should sit up with a bedrest and a straight back some part of the day and lie semi-recumbent or on their sides at night. The disadvantage of the supra-pubic apparatus is that it hampers the patients' movements and tends to keep them in bed an unduly long time. They may generally sit up out of bed on the fourth day and should be able to walk about by the tenth day although the wound will generally take three weeks to heal. The urine is measured, that is, any passed naturally, or drawn off by catheter, or draining into a receptacle.

Rigors and catheter fever (p. 246) may occur during the first few days after operation.

Endoscopic resection is a new method of removal of part of the prostate gland. The preparation is that already described.

After the operation, continuous bladder lavage is employed, copious fluids are given by mouth, also urinary antiseptics. Each time after the patient has passed urine a catheter is passed to remove residual urine, and is continued until the residual urine is two ounces or less. The catheter is then passed daily and gradually discontinued. The nursing and after-treatment is that already described.

Unfavourable symptoms.—Rise or sudden drop in temperature, quick and feeble pulse, pyuria (p. 237), haematuria (p. 237), vomiting, rigor.

Complications.—Shock (p. 561), haemorrhage (p. 563), sepsis (p. 569), pneumonia (p. 251), syncope (p. 276). Haemorrhage is treated by washing out the bladder with very hot normal saline solution; temperature 112°–120° F. unless otherwise ordered. (For other treatment of haemorrhage see p. 563.)

Lithotrity consists in crushing a stone in the bladder.

Preparation for general anaesthesia (p. 446).—The patient is usually under treatment for several days prior to the operation in order that the bowels may be regulated, and any inflammation of the bladder, reduced by suitable drugs, daily washing out of the bladder, and careful feeding.

Purification consists in washing out the bladder and leaving half a pint of water or boracic lotion within (p. 70). No dressings are required beyond swabs, and sterilized glycerine.

Temperature, pulse, and respiration are taken every four hours during the first 48 hours in case of rigors or catheter fever occurring.

Diet.—Liquid and unstimulating food is given for the first few days, then ordinary diet.

Nursing.—The urine is measured and a daily specimen put up and tested. It may be necessary to strain the urine through muslin before emptying it away in order to preserve gravel or debris of stone. Retention of urine may follow the operation and is relieved by catheter (p. 68). The patient needs to be kept very warm. The bowels are kept freely open. If all goes well the patient is allowed up at the end of a week.

Unfavourable symptoms.—Rigor (p. 207), pain, haematuria (p. 237).

Complications.—Catheter fever (p. 246), sepsis (p. 569).

Operations are performed for the following conditions, the after-treatment being much the same for all:

Hydrocele, a collection of fluid in the scrotum (p. 191).

Haematocele, a tumour formed by extravasation of blood into the scrotum.

Varicocele, varicose enlargement of the spermatic veins (p. 279).

Orchectomy, excision of the testicle, performed in cases of tuberculous and malignant diseases, and also for some malformations such as undescended testicle.

Undescended Testicle.—Operations may be undertaken to place the testis in the scrotum and retain it in position by long sutures attached to a special frame known as a scrotal cradle.

Hernia is the protrusion of any viscus from its containing cavity through a natural or artificial aperture into the surrounding tissues; the tissue immediately covering the protrusion being termed the sac. The most common sites for a hernia are the abdomen, chest wall, and cranium. In an abdominal hernia the sac wall is formed of the peritoneum.

Slight cases of abdominal hernia are treated with a truss (Plate XX), in others an operation known as the radical cure is undertaken.

A hernia is termed reducible when it admits of being replaced in the abdomen; irreducible, when not replaceable but without constriction; and incarcerated or strangulated, when it not only cannot be replaced but also suffers constriction (p. 513).

Femoral hernia, a protrusion through the femoral ring.

Inguinal hernia, bubonocele, or hernia at the groin; hernia which protrudes through one or both abdominal rings.

Umbilical hernia, one which protrudes through the umbilicus.

Ventral hernia, one occurring at any part of the front of the abdominal parietes.

Congenital hernia.—See p. 612.

Preparation for general anaesthesia (p. 446).—Spinal analgesia is used in some of these cases (p. 445).

Purification (p. 433).—Complete shaving of the pubes is necessary (see shaving, p. 438).

The usual *dressings* are required (p. 40).

Appliances.—A bolster in cover.

After-dressing.—Usually on the tenth day for the removal of clips or stitches. Second day if a drainage tube has been inserted.

The *diet* is ordinary.

Nursing.—The patient is placed in the recumbent position with the knees flexed over a bolster, and kept lying down but allowed to turn on to the unaffected side. The dressing must be carefully protected on return from the operation (p. 443). A male patient should be instructed to turn on to the unaffected side when passing urine to prevent the dressing becoming soiled. In women the vulva should be carefully dried with a piece of wool after urine is passed. For infants a specimen glass or receiver may be fixed in position, the legs being tethered to sand-bags. In the event of the dressing becoming soiled, the surgeon must be informed immediately so that it may be attended to, otherwise the nurse should re-dress the wound after taking the usual precautions (see dressings, p. 437). This accident should never occur with good nursing. These patients are confined to bed for three weeks, but allowed to sit up in bed after the stitches have been removed. A firm bandage is applied for the first week before the patient gets up. Shock (p. 561) is of common occurrence after orchectomy.

Unfavourable symptoms.—Rise of temperature, pain.

Complications.—Sepsis (p. 569).

Operations on the Penis.—Circumcision, amputation of the penis, and plastic operation for the cure of deformities such as epispadias and hypospadias (p. 612).

Circumcision consists in the removal of a small circular portion of the foreskin. Commonly performed on children for phimosis (p. 612), it may also be performed on adults.

Preparation for general anaesthesia (p. 446).

Purification (p. 437)

Dressings required.—Gauze, ribbon gauze, wool, square of boric lint with a hole cut in the centre.

After-dressing.—Daily, or when necessary. Stitches are removed about the tenth day.

Nursing.—Scrupulous cleanliness is necessary to prevent sepsis. It is a good plan to let the child sit in a bath once or twice a day. Some surgeons employ no dressing, the part is dusted over with an antiseptic powder after cleansing with an antiseptic lotion. The urine passed should be measured. In the case of an infant the nurse must see that it is passed. Should there be difficulty, a warm bath will probably suffice, if not, the surgeon must be informed.

Unfavourable symptoms.—Pain, redness, swelling.

Complications.—Haemorrhage (p. 563), sepsis (p. 569).

Amputation of the Penis is undertaken in cases of malignant disease.

Preparation and after-nursing are as described on p. 460.

Nursing.—A catheter will probably be tied in position, otherwise the patient will be catheterized regularly (p. 68). When the wound has healed the patient is allowed to pass water. The urine must be measured. After plastic operations the same nursing is required. Should the patient be allowed to pass urine before the wound is healed, the wound is re-dressed each time.

Unfavourable symptoms.—Rise of temperature and pulse, pain, cystitis, rigor.

Complications.—Catheter fever (p. 246), haemorrhage (p. 563), sepsis, shock (p. 561).

Operations on the Rectum

Sigmoidoscopy, examination of the rectum with the sigmoidoscope.

Preparation is that given below for rectal operation, omitting the purification.

Proctectomy, or excision of the rectum, performed in cases of malignant disease (p. 314).

Operations are also undertaken for the removal of haemorrhoids (haemorrhoidectomy) (p. 279), incising and draining an ischio-rectal abscess, fistula, anal fissure (p. 189), and anal abscess.

Rectopexy, performed for fixing the rectum in cases of prolapse of rectum.

Preparation.—This should extend over four days, or longer, prior to the operation (p. 499). Easily digested and nourishing food must be given during this time. An aperient is usually ordered four nights before the operation and a simple enema each morning. Forty-eight or thirty-six hours before the operation is to take place ol. ricini ℥j is given, followed by a copious simple enema (p. 60) in twelve hours' time. The enema is repeated on the morning of the operation, the rectum being washed out until the water returns clear. Some surgeons order the enemata to be given in the genu-pectoral position (Fig. 253), others like the long rectal tube used (p. 61). In cases of excision of the rectum and rectopexy liquid diet only is given on the preceding day, clear soup, tea, coffee made with milk, milk and water, glucose drinks, albumin water, etc. The patient is prepared for general anaesthesia (p. 446). Hypodermic injections of morphia and atropine or other basal narcotic (p. 450) are commonly ordered.

Purification (p. 437) includes shaving of the genitals with the exception of the supra-pubic hair. In women a vaginal douche (p. 71) should be given.

Dressings required (p. 40).—A T-bandage in addition to roller bandages is needed. The patient should have a clean T-bandage fastened around the waist, the ends being rolled and pinned when placed in position on the table. The bandage is left rolled but unpinned when the patient is placed in the lithotomy position (p. 454).

Diet.—Liquid cold food in small quantity is necessary until the bowels are allowed to be open. Food which does not create much residue should be given, such as albumin water, jellies, diluted milk, etc.

After-dressing.—On the second day and subsequently, when the bowels are opened. After excision of the rectum the dressing is done daily. A daily rectal wash-out is given after rectopexy; the bowels are not allowed to be opened for a week.

Temperature, pulse, and respiration are taken every four hours after excision of the rectum until normal.

Nursing.—The urine is measured, as retention is common. Women suffering from retention may be allowed to turn on their elbows and knees (see Fig. 258). Catheterization is frequently necessary in male patients. An aperient is commonly ordered about the fourth night, and is followed by an oil enema (p. 62) which is given through the drainage tube in the rectum so that it may be retained about an hour before the castor oil acts, and followed by a simple enema at the end of this time if necessary. The patient should not be left during the first action of the bowels, as it causes a great deal of pain, in some cases may produce a fainting attack, so that the nurse must be within call with appropriate remedies such as smelling salts, sal volatile, etc. A mild aperient such as confection of senna or liquid paraffin is usually ordered to be given every night subsequently. After rectopexy and excision of the rectum, the patient should be nursed on a water pillow (p. 22). The recumbent position is maintained, but the patient should be turned on the side, as it is a much more comfortable position. Severe shock is common after excision of the rectum; as it is a serious and lengthy operation, everything should be in readiness (see shock, p. 561). Saline infusion, if ordered, will be given subcutaneously (p. 82) or intravenously (p. 74).

The time the patient is confined in bed is variable. After haemorrhoids, allowed up at the end of a fortnight; after operations for fistula and abscess, when healed; after rectopexy, three weeks or a month; after excision, when healed or nearly so.

Unfavourable symptoms.—Rise of temperature above 101° F. or sudden drop; rapid, feeble pulse; vomiting; distension of abdomen (p. 209).

Complications.—Haemorrhage (p. 563), sepsis (p. 569), embolism (p. 282), and after excision of the rectum peritonitis (p. 512). During convalescence after an operation for anal abscess or fissure, rectal bougies (p. 63) may require to be passed every few days.

CHAPTER XV

ABDOMINAL OPERATIONS AND THEIR COMPLICATIONS

An abdominal operation is here taken to mean any operation performed within the peritoneum through the abdomen, and includes gynaecological intra-pelvic operations.

Abdominal operations are termed major operations, and their success depends in a great measure on the most careful preparation and after-nursing with the closest observance and attention to every detail. They may be divided into two classes: (1) those undertaken for an acute and urgent condition such as perforation, strangulation, abscess, accident, or injury, etc., and (2) those performed during a quiescent period, or when the condition is not such as to require immediate interference, as appendicectomy after an acute attack has passed, removal of tumours, etc.

Preparation for an Abdominal Operation (Subacute).—(For immediate operation for an acute condition, p. 505; preparation of the room, p. 431; general technique, p. 430.) The patient is usually under treatment for four or five days prior to the operation in order (1) to ensure surgical cleanliness; (2) to improve the general condition and strength by means of rest and suitable nourishing food; (3) to render the alimentary canal as free from germs as possible by attending to the hygiene of the mouth, i.e. septic stumps may require removal, and the mouth and teeth must be kept clean by the use of an antiseptic mouth wash and tooth brush (p. 15), regulation of the bowels, and in some instances the addition of intestinal antiseptics such as Salol may be prescribed; (4) to enable the blood to be grouped (p. 77) in case blood transfusion becomes necessary either before, during, or after the operation; (5) to enable the patient to become used to the nurses, surroundings, and the position that will have to be maintained after the operation.

Preparatory Treatment.—A daily bath (p. 116) or blanket bath (p. 11) is given, special attention being paid to the umbilicus, nails, and hair, the head should be washed once at least during this time and oftener if not clean (p. 423). A mouth wash is given three times a day, which is continued until the patient is discharged. If practicable, the patient is weighed. The temperature (p. 192) and pulse (p. 200) must be taken twice daily. The urine should be measured for 24 hours and tested. (For urine testing see p. 35.) Drugs may be prescribed during this period and include aperients; stimulants, such as hypodermic injections of strychnine, may be prescribed in critical cases; sedatives are sometimes ordered.

During this time the nurse should observe the patient closely and any abnormal symptom which may occur must be reported to the surgeon. (For observation of symptoms see Chapter V.)

Preparation for an Operation to take place at 2 p.m.:

Previous day:

6 *a.m.* Ol. ricini ℥j if an adult, or the aperient usually taken.
8 *a.m.* Breakfast: Tea or coffee, boiled egg, toast, etc.
Dinner: Steamed fish, bread and butter, no potato, milk pudding.
Tea: Tea, sugar, toast and butter.
6 *p.m.* Shaving (p. 438); bath.
7 *p.m.* Purification (p. 437).
8 *p.m.* Supper: Clear soup or bovril, toast, jelly.
10 *p.m.* Glass of hot milk with glucose, repeated during the night if awake.
As a preventive of shock and post-anaesthetic vomiting many surgeons order sugar to be given either in milk or tea or eaten as barley sugar for 24 hours prior to the operation.

The usual dressings (p. 40) will be required at the operation, and, in addition, a well-fitting many-tailed bandage (p. 145) for which the patient should be measured.

Day of operation:

7 *a.m.* Simple enema only if ordered.
8 *a.m.* Breakfast: Tea or coffee, sugar, toast and butter.
9 *a.m.* Bath.
9.30 *a.m.* Purification (p. 438).
11 *a.m.* Cup of bovril, tea, glucose and lemon, or sweetened albumin water, not more than six ounces, and sugar.
1 *p.m.* Dress in operation clothes (p. 436). Rectal saline, if ordered (p. 58), followed by a hypodermic injection of morphia and atropine or other basal narcotic ordered (p. 450).
1.50 *p.m.* Catheter (p. 66) if ordered, or direct the patient to empty the bladder if catheterization is not required.
1.55 *p.m.* Patient is taken on trolley to the anaesthetic room.

The above table will require alteration according to the time at which the operation is to take place. In a morning operation it will not be possible for the patient to have a bath on the day of operation, as there would not be sufficient time to repurify the abdomen, a blanket bath must be substituted; but in an afternoon operation, if the patient is able, a morning bath is much the more cleanly and refreshing procedure. In patients unable to have a bath, blanket bathing is substituted.

Preparation for the Patient's Return.—The bed is prepared as an operation bed (Plate II A). A water pillow (p. 23), air ring, or sponge rubber cushion is desirable if the patient is to be nursed in the Fowler position (p. 26), as it enables him to sit so much more comfortably, and if the water pillow is filled with warm water (not too hot) it is a valuable means of raising the temperature of the body where the patient is suffering from shock (p. 561).

The following things should be in readiness: Blocks, abdominal cradle, bolster for knees, extra pillows for propping up. Hot-water bottles filled and properly covered (p. 29), electric thermal pad or blanket, blankets in addition to those on the bed. Sterilized normal saline (p. 46) solution, hot and cold; rectal saline apparatus (p. 58), black coffee, brandy; oxygen and carbon dioxide, hypodermic syringe, coramine, adrenalin, etc., ammonia, or smelling salts; tongue depressor, gag, and tongue forceps; sponge holders, swabs, throat sponges, vomit receiver, towel.

After-treatment.—See also p. 460.

Position.—On return from the operating-room, the patient is placed in bed with the head low and turned to one side (p. 453). The knees are flexed over the bolster (Fig. 6), the patient is covered with a warmed blanket, and thermal pad or hot bottles are arranged at a suitable and safe distance (p. 29). A cradle is placed over the abdomen (if necessary) and the bed is made. Patients to be nursed in the Fowler position (p. 26) are raised as soon as they recover from the anaesthetic and have recovered from shock, if present. The knee bolster is then fixed; this is best done by fastening the end of the bolster to the head of the bed with straps or firm bandage (Fig. 8), or by rolling it in a drawsheet and tucking the ends beneath the mattress, the latter method causing less pressure.

When the patient is suffering from profound shock and after Wertheim's hysterectomy, the Trendelenberg position is maintained for some hours by raising the foot of the bedstead on chairs for an hour or two, then substituting 12-inch blocks for 12 hours. These patients are disturbed as little as possible.

Temperature, pulse, and respiration are taken every four hours during the first six days, or until normal. The pulse is counted frequently during the first twelve hours in addition to the times for charting.

Diet.—No food is given by mouth for 12 hours after the operations, the white of an egg or glucose given with the rectal saline being sufficient. Until post-operative vomiting ceases, nothing but sips of water are allowed by mouth, or the mouth may be washed out with soda water into which a few drops of lemon have been squeezed, which will be found most refreshing. Small quantities of albumin water, tea, coffee, or milk and water are then allowed and gradually increased until full liquid diet (p. 789) is being taken. Light solid diet is allowed after the bowels have acted, except in cases of operations on the alimentary canal which require special feeding, directions for which will be found under the respective operations.

After-dressing.—The wound is dressed on the second day if a drainage tube has been inserted, and from the eighth to the tenth day for the removal of stitches. The dressing may require changing every 4 hours if a Keith's tube (p. 441) has been used, and also in septic cases in which there is a copious discharge. Vaginal packing is usually removed by the surgeon after 24–48 hours, a sterile pad being applied.

Treatment.—Rectal saline may be ordered to be given by the continuous method (p. 58) if the case is a severe one, otherwise an injection of ½ pint of saline with the white of an egg or glucose (p. 58) is commonly prescribed to be given every 4 or 6 hours until the patient is able to take nourishment by mouth. The passage of flatus (p. 209), either by rectal tube or naturally, is of the utmost importance, and the nurse must be able to report accurately as to this. When passing the rectal tube for the administration of the saline, it should be left in the rectum with the end in a bowl of water for a few minutes (see rectal flatus tube, p. 61) before injecting the saline, this will often allow of the passage of flatus and so prevent using the flatus tube. Should the patient not be having rectal injections, and be unable to pass flatus, instructions will probably be given for a rectal flatus tube to be passed. If distension is present and is not relieved by the passage of the flatus tube, a turpentine or an asafoetida enema (p. 62) may be ordered and the nurse must make special note as to whether flatus is passed. Some surgeons order a rectal wash-out consisting of either plain water, soap and water, or saline solution. The fluid is given with a rectal tube and funnel, using about one pint, the funnel is then inverted over a receptacle below the bed and the fluid drawn off by siphonage; several pints of fluid may be used until it is returned clear.

As a rule the patient will be able to pass urine in eight hours' time or earlier, but if retention is present means must be tried for its relief (p. 238); if unsuccessful, a catheter should be passed, as the bladder must not be allowed to become distended, especially in the case of pelvic operations. Some surgeons order catheterization during the first twenty-four hours; the nurse should inquire from the surgeon what his wishes are regarding this matter. After Wertheim's hysterectomy, catheterization is usual for some days, and even after the patient passes urine naturally it is necessary to catheterize every 6 hours to remove residual urine, caused by loss of tone of the bladder. Catheterization is continued until the tone of the bladder is regained and no residual urine is found. The urine should be measured during the first week. An aperient is ordered, in the majority of cases on the second night, and is followed by a simple enema (p. 62) in the morning if necessary. Sedatives are prescribed if the patient is restless, irritable, or in much pain; the nurse must, therefore, inform the surgeon if such is the case. Sedatives may also be ordered if it is necessary to keep the intestine at rest. Drugs ordered may be either aspirin or bromide, to be given by the rectum if there is vomiting; in more severe cases morphia, or heroin, may be ordered hypodermically (p. 84). Morphia is not as a rule ordered in acute cases, as it may mask any untoward symptoms.

Nursing.—The extra blankets should be removed as soon as the patient has recovered from shock (see reaction, p. 561), the stockings may also be removed if desired, or left until the following morning. An open-backed nightgown or shirt (p. 12) should be worn during the first week, in order to disturb the patient as little as possible. The day after the operation it will suffice to wash the face, hands, back, and external genitals, and to gently comb and brush the hair. A mouth wash is given three times a day, and the mouth is swabbed out in addition to cleansing the teeth night and morning (for the care of the mouth see p. 15). After gynaecological operations the vulva needs careful dressing in addition to the toilet described on p. 12. Great care is taken when swabbing, not to rub, but to use gentle dabbing movements to prevent abrading the mucous surfaces. The interior of the vagina needs to be dried with sterile dry swabs as fluids collect when a patient is lying flat. A sterile pad is applied after each vaginal dressing which is necessary after the micturition, defaecation, or catheterization. When making the bed, attending to the drawsheet, or giving the patient the bedpan or slipper, two nurses must lift the patient, who should be instructed to fold the hands in front so that no effort is made to help. This is necessary for the first week, except in cases where the wound has been closed completely; these cases, after the first 48 hours, may be lifted by one person if all is satisfactory. The drawsheet and top sheet should be changed as often as necessary, the under-sheet should not require changing for several days, as this entails considerable movement. Special care must be taken to prevent the patient contracting a chill, as a cough will cause pain in the wound and retard its healing. Delicate patients should wear a cotton-wool jacket (Fig. 99) in addition to the garments mentioned under operation clothing (p. 436), this jacket should not be left off until convalescent. To prevent straining on the recently cut parts, and to lessen the pain, the nurse should support the wound by gentle pressure on either side with her hands whenever the patient coughs, retches, or vomits, but the patient will very soon instinctively do this, unless the coughing or vomiting is severe. Patients nursed in a ward with others should have the bed partially screened off for the first 24 or 48 hours in order that as much sleep is procured as possible. No visitors should be allowed for the first three days, or until the surgeon gives permission, but the relatives should be instructed to make frequent inquiries if the patient is nursed away from home.

Points to be noted after Abdominal Operations.—Condition of the bowels, passage of flatus (p. 209), abdominal distension, urine, quantity passed, reaction, presence of albumin (see urine testing, p. 35); vomit, quantity, colour, reaction, frequency; temperature, pulse, and respiration; sleep; pain; condition of the dressing (p. 442).

Good Signs during the first 36 hours after Operation.—Pulse steady, fair volume, not quicker than 100 per minute, quieting down to 90 or less in the morning; temperature between 97°–99° F.; respiration about 24; colour good; consciousness soon regained; no restlessness; very little vomiting or retching, none after 12 hours; skin acting gently; saline injections retained; kidneys acting freely, urine passed naturally after the first 12 hours or before; flatus passed naturally or by tube; about 3 hours' sleep in all during the first night, increasing each successive night; no excessive pain, or hiccough.

Unfavourable symptoms.—Pulse small, quick, running uncountable; temperature below 97° F. or above 101° F.; respiration persistently shallow or sighing; restlessness; skin cold and clammy, cold extremities; profuse sweating; very little urine secreted; no flatus by rectum, a great deal by mouth; abdominal distension and pain; hiccough; colour dusky or blanched; incessant vomiting (vomit being brownish in colour). (For description of symptoms see Chapter V.)

Complications which may occur are: Internal haemorrhage (p. 511); peritonitis (p. 512); perforation (p. 513); shock (p. 561); sepsis (p. 569); intestinal obstruction (pp. 229, 513); parotitis;

thrombosis (p. 281); embolism (p. 282); bronchitis (p. 248); pneumonia (p. 251).

Preparation of Acute Abdominal Cases requiring Immediate Operation.—These are usually cases of injury, acute inflammation, abscess, internal haemorrhage (p. 511), perforation (p. 513), or rupture of any of the visceral organs, strangulation of the intestine (p. 513), ileus, intestinal obstruction, rupture of an ectopic gestation (p. 511), etc. They are all most serious conditions and attended with considerable danger, as the patient, as a result, may be suffering from severe shock (p. 561), internal haemorrhage (p. 511), or peritonitis (p. 512). These patients require the most unremitting gentle care and devotion, only a well-trained and experienced nurse should attend to them at first, or carry out the surgeon's treatment, as she will inspire the patient with confidence by knowing what to do and how to do it, doing all deftly, quickly, gently, thereby causing the minimum of disturbance.

Preparation of the room in a private house.—See pp. 4 and 431.

General operative technique.—See p. 430.

Preparation of the patient consists in carrying out the treatment ordered to reduce shock (p. 561). A simple enema (p. 62) is given only if ordered, the catheter is passed, and the urine tested. The abdomen and pubes should be shaved (p. 438). The abdomen is purified (p. 437). If food has been taken recently and vomiting has not occurred, the surgeon may require to wash out the stomach (p. 64). The patient's blood is grouped (p. 77) as blood transfusion may be necessary either before, during, or after the operation.

After-treatment.—The patient is put to bed with head low, and as soon as possible is raised into the Fowler position (p. 26).

After-dressing.—In cases where the peritoneum is infected the wound will not be closed completely, and frequent dressing may be required.

Diet.—No food is allowed by mouth for the first 36–48 hours, or until ordered; the diet is then the same as described on p. 502.

Treatment.—Continuous saline will probably be ordered, or intravenous (p. 74) or subcutaneous infusion (p. 82) or blood transfusion (p. 80) may be necessary. A stimulant in the form of brandy may be ordered to be given by rectum, until it can be taken by mouth. Drugs, ether, strychnine, coramine, digitalin, pituitary extract, morphia may be prescribed hypodermically.

Nursing.—The patient's back will require special care, as he may be in the sitting posture for three weeks or longer; the bandage induces sweating, and there is sometimes profuse discharge, so that the skin over the posterior iliac bones, the sacrum, and the fold between the buttocks need special care (for the care of the back see p. 17). A sponge rubber or air ring should be provided whenever possible (p. 23). The patient must be kept absolutely quiet and not allowed to move about or help himself in any way until the surgeon gives permission. In other respects the after-treatment is the same as that already given under abdominal operations (p. 501).

OPERATIONS ON THE STOMACH

Gastrotomy, or making an incision into the stomach either for the removal of foreign bodies, for exploring purposes, or for dilating a stricture.

Gastrostomy consists in making a permanent artificial opening into the stomach through which the patient may be fed, performed in cases of stricture and malignant disease of the oesophagus.

Diet.—No food is given by mouth, but the patient is allowed to wash the mouth out frequently; soda water, or lemon and soda water, proves very refreshing, water is allowed by mouth if swallowing is possible. Food is administered by rectum (see rectal feeding, p. 58) for the first five to seven days, after which gastrostomy feeding (p. 56) is ordered.

Gastrectomy is the removal of part or the whole of the stomach, performed in cases of malignant disease of the stomach (p. 314).

Gastro-enterostomy consists in making an artificial opening between the stomach and the small intestine, performed in cases of gastric ulcer (p. 219), duodenal ulcer (p. 224). stenosis of the pylorus (p. 220), hour-glass stomach, malignant disease (p. 314), or injury.

Pyloroplasty is an operation performed to increase the calibre of the pylorus, undertaken in cases of congenital pyloric stenosis (p. 613).

Rammstedt's Operation consists in splitting the anterior aspect of the circular muscle of the pylorus by longitudinal incision, and leaving the mucous membrane untouched. The preparation and after-treatment is described on p. 614.

OPERATIONS ON THE INTESTINES

Enterotomy consists in making an opening into the intestine for the removal of foreign bodies, or for exploratory purposes.

Enterostomy consists in making a permanent opening in the small intestine through which the patient may be fed; the feeding is as for gastrostomy. This operation may also be the making of an artificial opening in the ileum through which the faeces may be evacuated, and is undertaken in cases of malignant disease (p. 314) of the caecum. (For feeding these cases see colotomy, p. 508.)

Enteroplasty is an operation undertaken to increase the lumen of the intestine when a stricture is present.

Enterectomy, with end-to-end anastomosis, is the excision of a portion of intestine, and the reuniting of the divided ends, undertaken in cases of gangrene (p. 573), injury, removal of strictures, closure of a faecal fistula or artificial anus, intussusception (p. 229), colitis (p. 223).

Lateral Anastomosis and Lateral End-to-Side Anastomosis are operations undertaken in order to short circuit or put out of action either a malignant growth, a stricture, or some diseased portion of the intestine.

After-treatment.—The after-treatment and nursing are as described under abdominal operations (p. 501).

Diet.—After any of the above-mentioned operations on the stomach and intestine—with the exception of those operations in which it has been described—the feeding is as follows, variations being made according to instructions and the necessity of each case:

First 12 *hours* or longer: rectal feeding (p. 58) every 4 hours; sips of hot water by mouth after 12 hours. Frequent mouth washes of either hot water, soda water, or lemon and soda water.

1*st day*, starting in the morning: 1 ounce of either albumin water (p. 816), barley water (p. 819), peptonized milk (p. 814), or milk and water every hour, during the night, 2 ounces every 2 hours when awake; rectal feeding every 6 hours. Glucose may be added.

2*nd day:* 3 ounces every 2 hours, increasing to 5 ounces after 12 hours; rectal feeding every 8 hours, then discontinued.

3*rd day:* 5 ounces every 2 hours, Benger's food and custard may now be allowed. Semi-solid food is then given, starting with bread and milk, milk puddings, etc., and gradually increasing to thin bread and butter without crust, pounded fish, minced chicken, sieved vegetables; at the end of ten days the patient will be taking ordinary light diet, the chicken still being minced if the teeth are not good. At the end of a fortnight, minced meat and well-cooked vegetables are allowed, also stewed fruit and baked apples; the food is then gradually increased until an ordinary diet is being taken.

Aperient.—In *stomach cases* an aperient such as calomel may be ordered on the second night, followed by a simple enema (p. 62) in the morning, or a dose of sulphate of magnesia. A daily rectal wash out is administered whilst rectal feeding is continued.

In *intestinal cases* an aperient may not be ordered until the fifth night; ol. ricini is the aperient commonly prescribed and is followed by a simple enema in the morning. Food by mouth in these cases is restricted to cold liquids, albumin water, barley water, or meat juice until the bowels have been opened, and is then gradually increased as mentioned.

Colostomy, or Colotomy, consists in making an opening in the large intestine to provide an artificial anus, performed either as a preliminary to an operation on the rectum or as a *permanent opening in cases of* malignant (p. 314) disease of the rectum or a temporary opening in the small intestine for drainage. Except in acute cases of intestinal obstruction, the operation is performed in two stages; at the first operation the bowel is fixed in position outside the abdomen, at the second the bowel is opened and a Paul's tube (Fig. 203) is inserted.

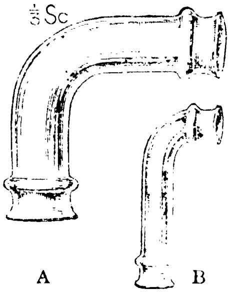


FIG. 203. Paul's colostomy glass tubes.

A for large intestine.
B for small intestine.

After-treatment.—The patient is given liquid diet, cold and in small quantities, either albumin water, barley water, meat juice, meat jelly, or milk and water, until the colotomy is opened; light solid diet increasing to full diet is allowed as soon as the bowels have been opened.

Aperient.—An aperient may be prescribed if necessary when the colotomy is open, and some surgeons order a daily wash out to be given through the colotomy; this is administered with a soft rubber catheter, tubing, and funnel, and should be given at the same time each day in order to train the bowel to act regularly, as this obviates the colotomy requiring attention at odd times, thereby causing inconvenience to the patient.

Dressing.—The colotomy is dressed twice a day and when necessary. The skin around the opening should be smeared with vaseline or simple ointment in order to prevent excoriation. A dry unmedicated dressing is used; some surgeons order carbolized tow as an outer covering. A colotomy belt is ordered when the patient is able to be up, it should be removed at night, a dressing of white gauze and wool or cellulose tissue being substituted. The colotomy belt must be cleansed with an antiseptic after removal and left to air until required next morning.

APPENDIX

Appendicectomy is amputation of the appendix, performed in cases of tuberculous disease, inflammation, or abscess (see appendicitis, p. 231). The operation may be undertaken either during an acute attack or during a quiescent period.

Appendicostomy consists in making an opening in the appendix through which irrigation of the large intestine may take place, used in the treatment of colitis (p. 223) and some other conditions of the large intestine. (For preparation and after-treatment see p. 499.)

OPERATIONS ON THE LIVER

Operations on the liver are performed for opening and draining an abscess, or for the removal or draining of hydatid cysts (p. 227). The treatment is that described on p. 499.

OPERATIONS ON THE GALL BLADDER

Cholecystectomy is the removal of the gall bladder, performed in cases of gall stones, suppuration, or for malignant disease.

Cholecystotomy consists in making an opening into the gall bladder for the removal of stones, or for draining purposes. After this operation a drainage tube or Paul's tube (Fig. 203) is inserted, and a sterilized urinal or infant's feeding bottle containing 1–2 ounces of an antiseptic solution is required; the protruding end of the drainage tube is placed in the antiseptic solution, and the bottle so arranged that it cannot slip out of position or cause pressure on the tube.

Cholecystenterostomy is the formation of an artificial communication between the gall bladder and the intestine, performed in cases of absolute stenosis of the common bile duct. (For preparation and after-treatment see p. 499.)

OPERATIONS ON THE PANCREAS

Operations are performed on the pancreas for draining cysts, suturing wounds, removal of growths, and in some cases of acute pancreatitis (p. 234) when suppuration has taken place. (For preparation and after-treatment see p. 499.)

OPERATIONS ON THE SPLEEN

Splenectomy is the excision of the spleen, performed in cases of rupture and wounds of the spleen, splenic anaemia (p. 285), splenomegaly, and malarial enlargement.

Splenopexy is the fixation of a floating spleen. (For preparation and after-treatment see p. 499.)

OPERATIONS ON THE ABDOMEN

Laparotomy consists in opening the abdomen to perform an operation, to explore, or to reduce an intussusception (p. 229), a strangulated hernia, or strangled intestine.

A Strangulated Hernia (p. 495) is one in which the contents are constricted in such a way as to obstruct and, later, arrest the flow of blood in the vessels contained therein; interference with the passage of faeces is also present if intestine is involved in the hernia. A few of these cases when seen in the early stages are able to be reduced by taxis (manipulation), but most frequently the hernia cannot be so reduced, and an operation is required, and is performed without delay (see acute abdominal operations, p. 505).

INTRA-PELVIC OPERATIONS ON THE FEMALE GENERATIVE ORGANS (GYNAECOLOGICAL OPERATIONS)

Preparation.—For the under-mentioned operations the following preparation is required in addition to that described on p. 499:

Purification.—Complete shaving (p. 438) and purification (p. 437) of the abdomen, pubes, and vulva. A vaginal douche is usually ordered twice a day during the preparatory period, and is also given as part of the purification; for the latter, perchloride of mercury (1-4000) is commonly prescribed. A catheter is passed 10 minutes prior to the operation in order to ensure the bladder being completely emptied, and the vagina may require plugging with gauze.

For *after-treatment* see abdominal operations, p. 499.

Operations on the Uterus.—**Hysteropexy**, or ventro-fixation, is the fixation of the uterus, performed in cases of prolapse and displacement (p. 684) of the uterus.

Myomectomy is the enucleation and removal of a uterine tumour apart from the uterus.

Hysterectomy (abdominal) is the removal of the uterus through the abdominal wall, and is termed pan-hysterectomy when the uterus with the cervix is removed. In these cases a dressing is applied to the vulva for the first week after the operation.

Wertheim's Operation is the removal of the uterus and cervix, the cellular tissue in its neighbourhood, the local lymphatic glands, and the upper part of the vagina, performed in cases of malignant disease of the uterus. It is always a serious operation, the patient commonly suffers a great deal from shock (p. 561).

Caesarian Section.—Consists in a laparotomy (p. 510) followed by incision into the uterus to remove a living child or a foetus. It is undertaken when the mother cannot be delivered in the usual way (p. 693). The after-nursing is that given under abdominal operations (p. 499) and also that given for lying-in (p. 692).

Operations on the Fallopian Tubes.—**Salpingectomy** is the removal of one of the Fallopian tubes, performed in cases of ectopic gestation, hydro-salpinx (p. 191), and pyo-salpinx (suppuration of the tube).

Salpingo-Oöphorectomy is the removal of an ovary and its tube, undertaken in cases of hydro- and pyo-salpinx, or for the removal of small solid cystic tumours, and sometimes for dealing indirectly with cancer of the breast.

Ruptured Tubal (Ectopic) Gestation is a condition in which the impregnated ovum commences to develop in the Fallopian tube instead of in the uterus, the tube gives way owing to over-distension; the operation consists in a laparotomy to remove the foetus and the damaged tube, and comes under the heading of an acute abdominal operation (p. 505).

Operations on the Ovary.—**Ovariotomy** is the removal of a diseased ovary, undertaken in cases of ovarian cyst, or for some inflammatory conditions.

Oöphorectomy is the removal of non-diseased ovaries for certain conditions, such as membranous dysmenorrhoea (p. 683), cancer of the breast (p. 314), etc.

After these operations on the ovaries mental symptoms may develop, the nurse must therefore be specially watchful (see mania, p. 404).

COMPLICATIONS OCCURRING AFTER ABDOMINAL OPERATIONS

Any of the following complications may occur after an abdominal operation, the nurse must therefore be familiar with the symptoms and report at once to the surgeon should they occur: Internal haemorrhage; peritonism; peritonitis; perforation; shock; sepsis; intestinal obstruction, or ileus; acute dilatation of the stomach; parotitis; thrombosis; embolism; bronchitis; and pneumonia.

(1) **Internal Haemorrhage.**—Concealed haemorrhage.

Symptoms.—The symptoms are pallor, restlessness, air-hunger, (p. 205), haemorrhagic pulse (see p. 514), or later imperceptible pulse, subnormal temperature, dilated pupils, fear.

Treatment.—Inform the surgeon, give no stimulants; rectal saline infusion (p. 58) may be given if the patient is becoming very collapsed. Open the windows, raise the foot of the bed on chairs or high blocks, bandage the arms and legs from below upwards with flannel bandages (p. 129) to keep the blood in the vital parts as much as possible; calm the patient and keep quiet, oxygen may be given if procurable. Prepare for intravenous infusion, transfusion (p. 74), and laparotomy. (For preparation for emergency operations see pp. 4 and 505.)

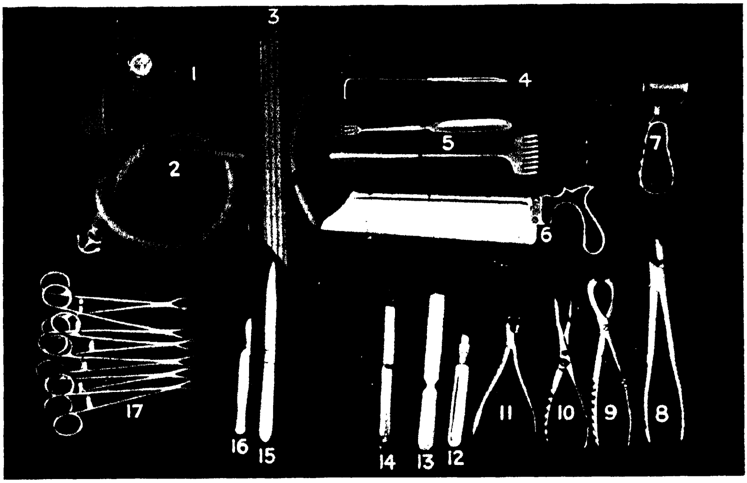
(2) **Peritonism.**—*Symptoms.*—The symptoms are: Flatulence (p. 209); distension; vomiting; inability to pass flatus by rectum, much flatus being passed by mouth; pulse raised above 100, temperature above 99° F.; abdominal pain.

Treatment.—A turpentine enema (p. 63), followed by calomel 1 grain every hour until 5 grains have been taken, then sulphate of soda 20 grains every hour until the bowels act, is the treatment commonly prescribed; or an enema of castor oil, olive oil, and turpentine may be ordered if the turpentine enema does not give relief. Hypodermic injections of pituitrin or strychnine may also be ordered to assist peristalsis.

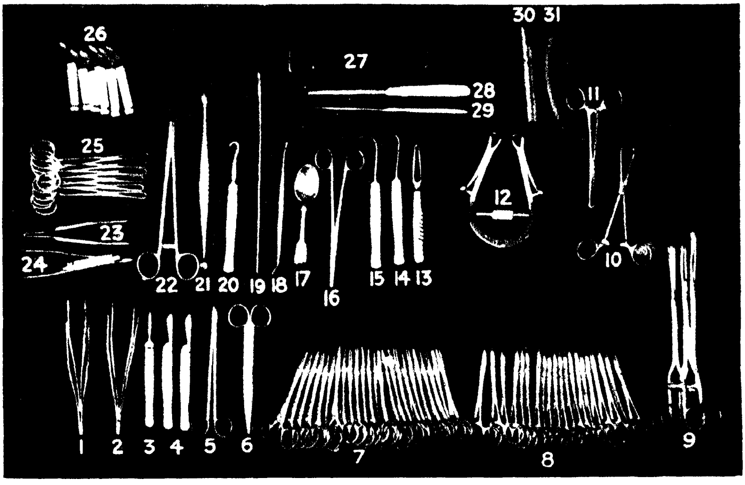
(3) **Peritonitis.**—*Symptoms.*—The symptoms include: Pain; distension; flatulence; vomiting, vomit being bile stained at first, then brown and faecal (p. 185); puking (p. 184); hiccough (p. 208); restlessness; the pulse is quick, hard, and wiry in the first stage, then weak, rapid, and compressible; the temperature is raised above 101° F. or subnormal; the respirations are quick, shallow, and thoracic (restricted abdominal breathing, p. 206); abdomen rigid and tender, constipation, and absolute arrest of flatus by rectum; the face is anxious, pinched, drawn, and may be either pallid or flushed. In acute cases death occurs in 12–14 hours, others with less toxaemia may not be fatal for three or four days. Recovery often takes place if treated in the early stages, the vomit gradually becomes less frequent, the brown colour disappearing, flatus is passed by rectum, the pulse-rate falls, and the bowels are opened.

Treatment.—The chief objects in the treatment ordered are to get the bowels to act, and to maintain the patient's strength until the toxins have been eliminated; to this end enemata (p. 62) and calomel are ordered to be given as for peritonism. Stimulants may be prescribed, the most usual being brandy by rectum, also hypodermic injections of strychnine. Continuous rectal saline (p. 58) or subcutaneous infusion every 4–6 hours is ordered. No food is given by mouth until the vomiting becomes less frequent, nourishment is given by rectum in the form of white of egg or glucose in the saline (see rectal feeding, p. 60). Morphia is seldom prescribed on account of causing further paresis (p. 361) of the intestine.

PLATE XVII · AMPUTATION (*above*) AND THYROIDECTOMY (*below*)

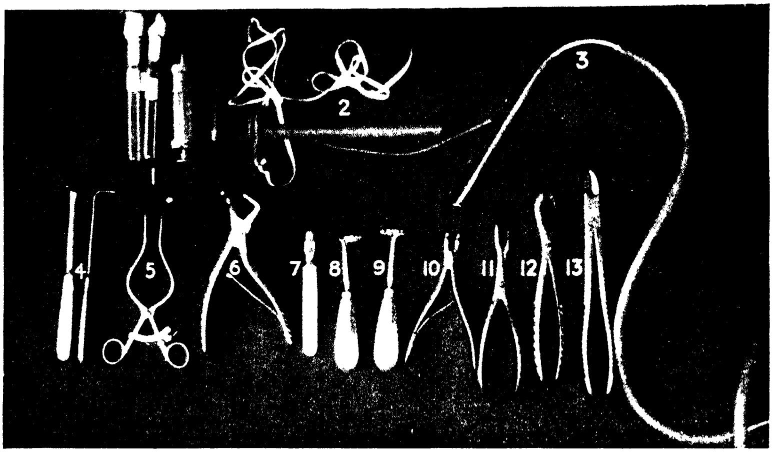


Instruments for Amputation of a Limb: 1, rubber bandage (Esmarch's); 2, tourniquet (Samway's); 3, drainage tubing, corrugated and circular; 4, retractor (Langenbeck's); 5, pronged retractors; 6, saw; 7, hammer; 8, Lane's bone-cutting forceps; 9, lion forceps; 10, sequestrum forceps; 11, gouge forceps; 12, raspatory; 13, rugine; 14, chisel; 15, amputation knife; 16, scalpel; 17, tissue forceps (*see also Plate XVIII*).

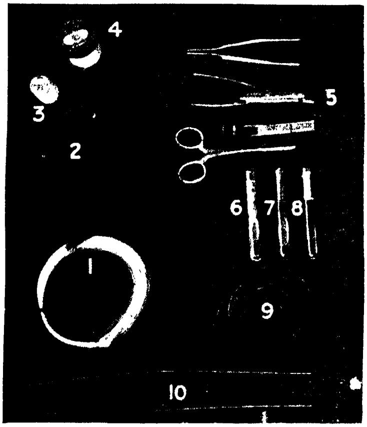


Instruments for Thyroidectomy: 1, rat-toothed dissecting forceps; 2, plain dissecting forceps; 3, tenotomy knife; 4, scalpels; 5, fine curved scissors; 6, Mayo's dissecting scissors; 7, twenty-five 5' S.W.A.F.; 8, twenty curved Dunhill's artery forceps; 9, swab-holders; 10 and 11, thyroid tenaculum forceps; 12, Joll's thyroid retractor; 13, Kocker's thyroid enucleator; 14 and 15, aneurysm needles; 16, sinus forceps; 17, small spoon; 18, probe and dissector; 19, silver probe; 20, single blunt hook; 21, Volkman's spoon; 22, Joly needle-holder; 23 and 24, Michel clips, forceps, and gallery; 25, clips for skin towels; 26, cross-action towel-clips; 27, Lane's retractor; 28 and 29, two finger retractors; 30, corrugated drain (or) 31, drainage tube.

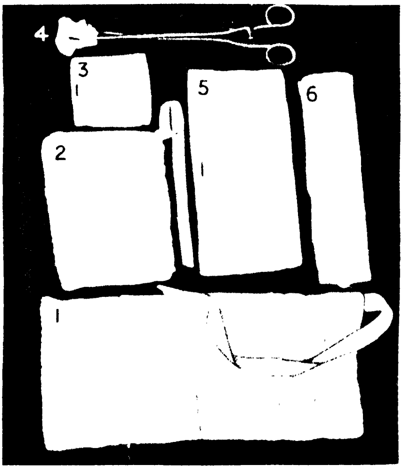
PLATE XVIII · EMPYEMA · SUTURE MATERIALS · SWABS



Instruments for Resection of Rib for Empyema: 1, exploring syringe and needle and test tubes; 2, Tudor-Edwards's drainage tube; 3, sucker; 4, Langenbeck's finger retractors; 5, Stanley Boyd self-retaining retractor; 6, rib shears (Doyen's); 7, Farabœuf's rugine; 8 and 9, left and right rib elevators; 10, bone-nibbling forceps; 11, sequestrum forceps; 12, lion bone-holding forceps; 13, bone-cutting forceps.

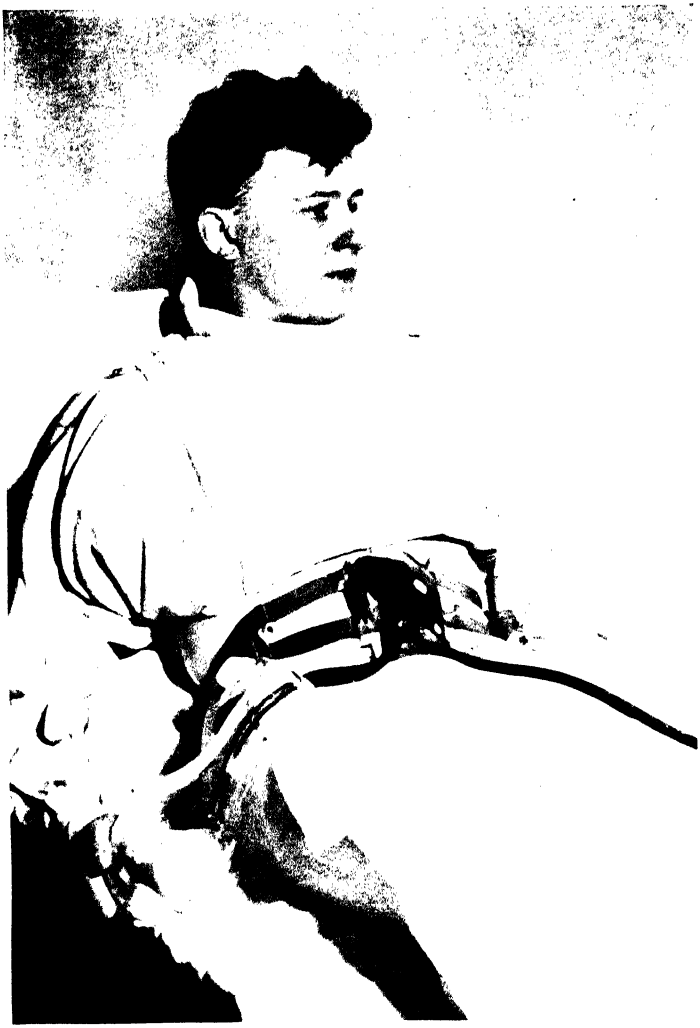


Suture Materials: 1, silkworm gut; 2, horse-hair; 3, Chinese twist silk; 4, Barbour's linen thread; 5, Michel clips with forceps, gallery, and remover; 6, tube of plain catgut; 7, tube of chromic twenty-day catgut; 8, kangaroo tendon; 9, Viennese twist wire; 10, silver wire.



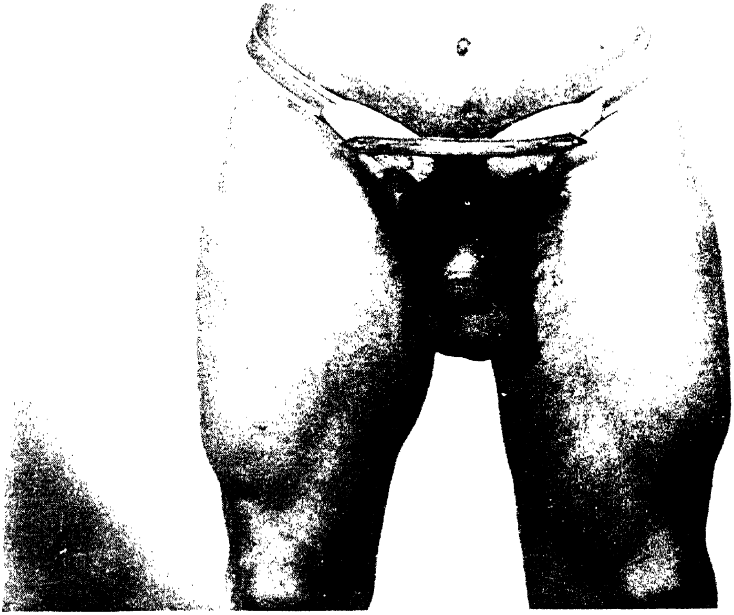
Swabs: 1, abdominal pack, 12" × 6"; 2, abdominal pack, 8" × 6"; 3 and 4, muslin swab, 4" × 4", with metal staple; 5, muslin swab, 9" × 5", with metal staple; 6, roll gauze.

PLATE XIX · SUPRA-PUBIC DRAINAGE



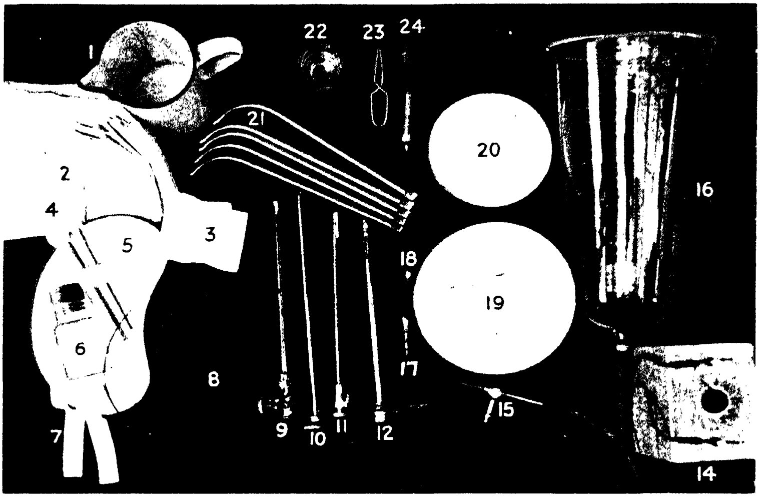
Irving's box for supra pubic drainage applied.

PLATE XX TRUSS

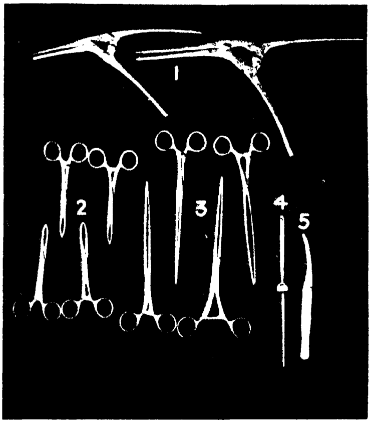


Double inguinal truss applied

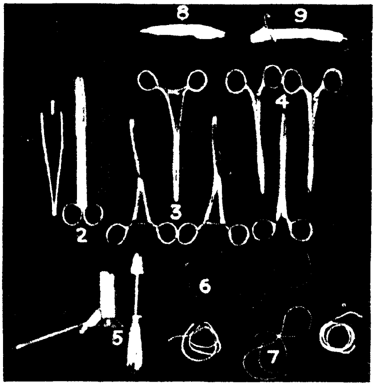
PLATE XXI · CYSTOSCOPY · HERNIA · HAEMORRHOIDECTOMY



Instruments for Cystoscopy and Ureteric Catheterization: 1, graduated enamel measure; 2, sterile towels; 3, sterile swabs; 4, labelled sterile test tubes; 5, sterile receiver; 6, sterile bottle for catheter specimens of urine; 7, two strips strapping (for test tubes holding ends of ureteric catheters); 8, right and left ureteric catheters; 9, double catheterizing attachment (cystoscope); 10, optic system (cystoscope); 11, obturator (cystoscope); 12, operating sheath (cystoscope); 14, battery and flex; 15, two-way tap attached by sterile tubing to 16, graduated douche flask and saline; 17, metal connection for cystoscope; 18, spare sterile bulb for cystoscope; 19, warm 1–80 carbolic; 20, lubricant (K. Y. jelly); 21, Lister's metal bougies; 22, local injection (Percain 1 in 250 in normal saline); 23, penal clips; 24, penal syringe.

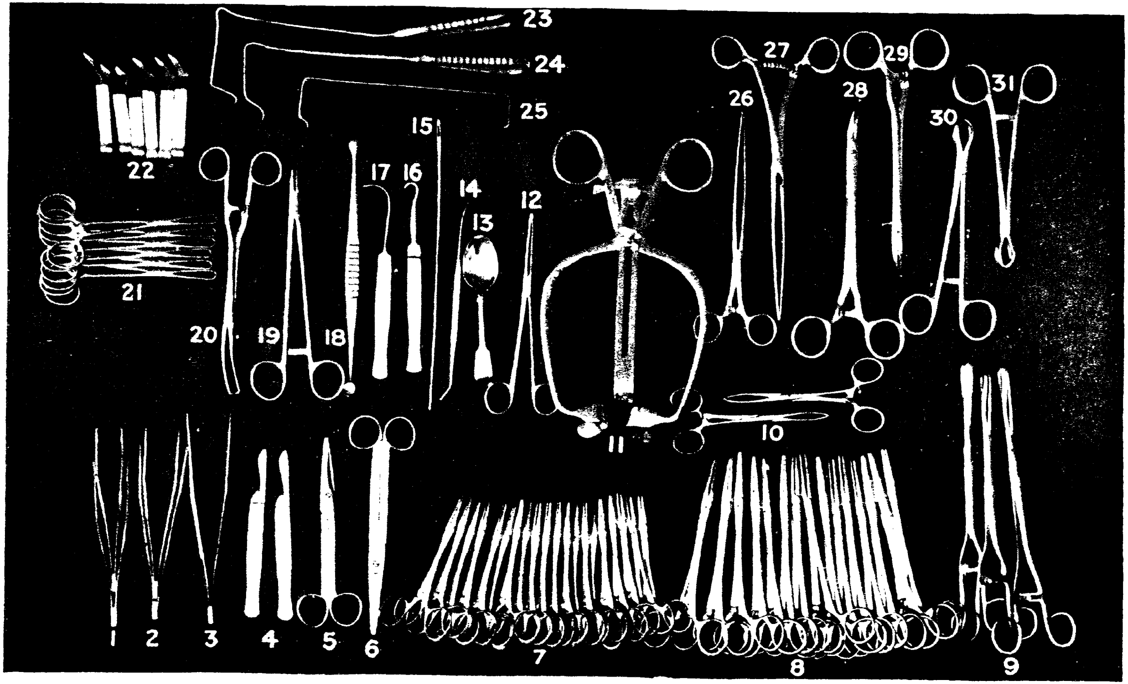


Instruments for Strangulated Hernia (Resection of Gut): 1, two Payr's bowel crushers; 2, four Porrier forceps; 3, four Doyen's bowel clamps; 4, hernia director; 5, hernia knife.



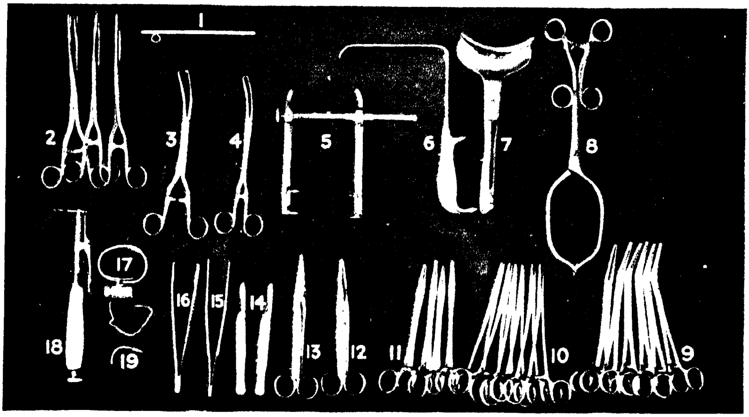
Instruments for Haemorrhoidectomy: 1, Lane's toothed dissecting forceps; 2, ight blunt-pointed scissors; 3, haemorid clamps; 4, Spencer-Wells artery reeps; 5, proctoscope; 6, No. 3 or No. 8 catgut on round-bodied needles; 7, No. 3 or No. 8 Chinese silk ligatures; 8, plug of wool soaked in 1–500 perchloride of mercury; 9, drainage tube covered with vaseline gauze.

PLATE XXII .GENERAL ABDOMINAL SET OF INSTRUMENTS

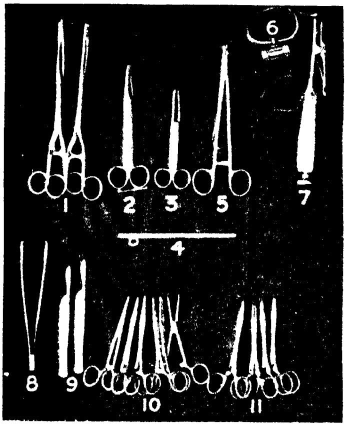


1. two pairs Lane's rat-tooth dissecting forceps; 2, two pairs plain dissecting forceps; 3, Waugh's (long) dissecting forceps; 4, two scalpels; 5 and 6, short and long Mayo's scissors; 7, twenty 5" S.W.A.F.; 8, fifteen 7" S.W.A.F.; 9, three swab-holders; 10, two Porrier forceps; 11, Mayo's self-retaining retractor; 12, sinus forceps; 13, small spoon; 14, Watson-Cheyne probe and dissector; 15, silver probe; 16, single blunt hook; 17, aneurysm needle; 18, Volkman's spoon; 19, Joly needle-holder; 20, vulsellum forceps; 21, skin towel-clips; 22, cross-action towel clips; 23 and 24, Morris-Spoke retractors; 25, Lane's retractor; 26 and 27, two Doyen's bowel clamps; 28 and 29, Moynihan's artery forceps; 30 and 31, Lane's tissue forceps.

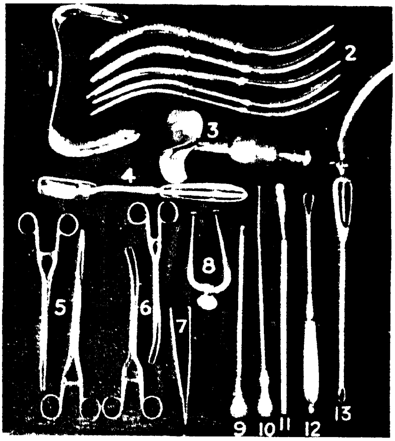
PLATE XXIII · HYSTERECTOMY · COLPO-PERINAEORRHAPHY · DILATATION OF UTERUS



Instruments for Hysterectomy: 1, silver catheter (2); 2, three ovum forceps; 3 and 4, two pairs vulsellum forceps; 5, Gossett's self-retaining retractor; 6, deep abdominal retractor; 7, Doyen's bladder retractor; 8, Berkeley-Bonney vaginal forceps; 9, six pairs curved Kocker's forceps; 10, six pairs 7″ straight Kocker's forceps; 11, four pairs 7″ straight Spencer-Wells forceps; 12, Mayo's scissors angled on the flat; 13, Mayo's scissors, 7″ straight; 14, two scalpels; 15, Waugh's long dissecting forceps; 16, Bonney's dissecting forceps; 17, Bonney's wristlet with No. 2 corded catgut, second one with No. 1 Chinese silk; 18, Reverdin needle and holder; 19, blunt-ended Reverdin needle.

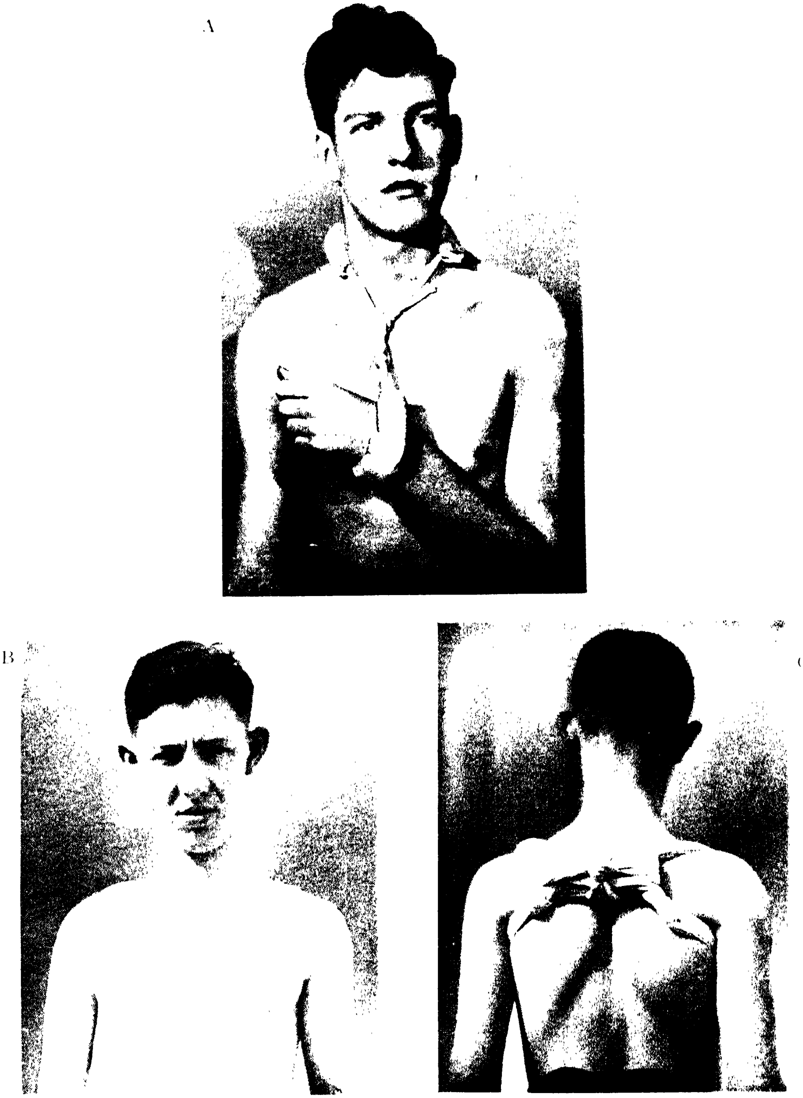


Instruments for Colpo-perinaeorrhaphy: 1, swab forceps; 2, Mayo's straight scissors; 3, angled-on-the-flat scissors (short); 4, silver catheter (2); 5, half-circle round-bodied needle with No. 2 catgut; 6, Bonney's wristlet with No. 2 corded catgut; 7, Reverdin needle and holder; 8, Bonney's dissecting forceps; 9, two scalpels; 10, six 5″ Kocker's artery forceps; 11, four 5″ Spencer-Wells artery forceps.



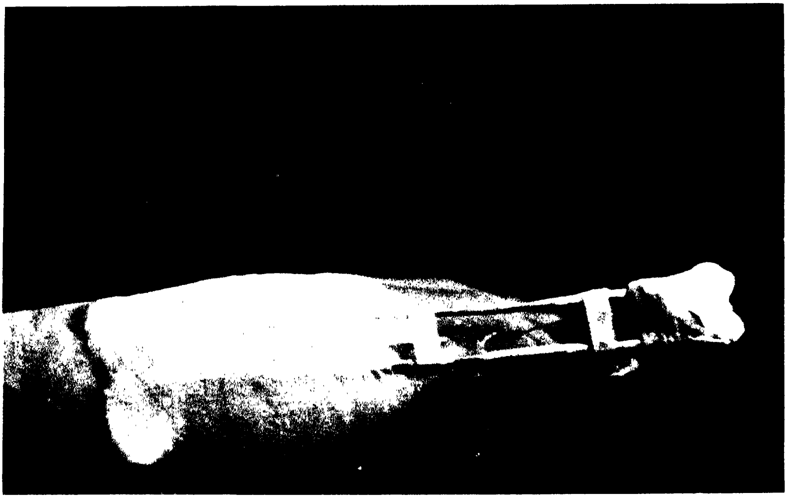
Instruments for Dilatation and Curettage of Uterus: 1, Sims's vaginal speculum; 2, Fenton's cervix dilators; 3, Anvard's vaginal speculum; 4, Wertheim's bladder retractor; 5, two ovum forceps; 6, two vulsellum forceps; 7, Bonney's dissecting forceps; 8, Comyn and Berkeley's vaginal retractor; 9, bladder sound, female; 10, uterine sound; 11, probe; 12, curette; 13, flushing curette.

PLATE XXIV · SLINGS—FIXATION FOR FRACTURES

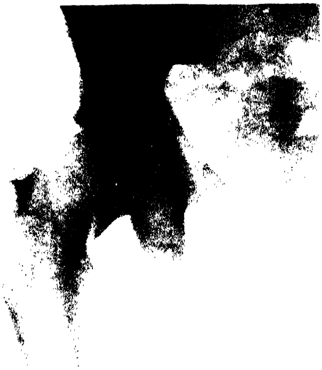


A. Thomas's collar and cuff sling applied for fracture of humerus.
B. Three handkerchief slings for fracture of clavicle. Front view.
C. Three handkerchief slings for fracture of clavicle. Back view.

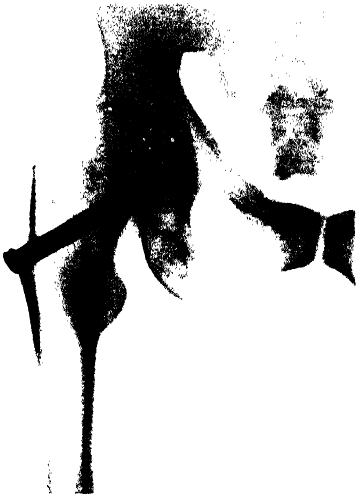
PLATE XXV · TREATMENT OF FRACTURES



A. Fracture of the metacarpal of the thumb treated by fixed traction by means of a wire inserted into the tip of the thumb. The wire is fixed to the end of a small metal splint, which is incorporated in a plaster surrounding the forearm and thumb.

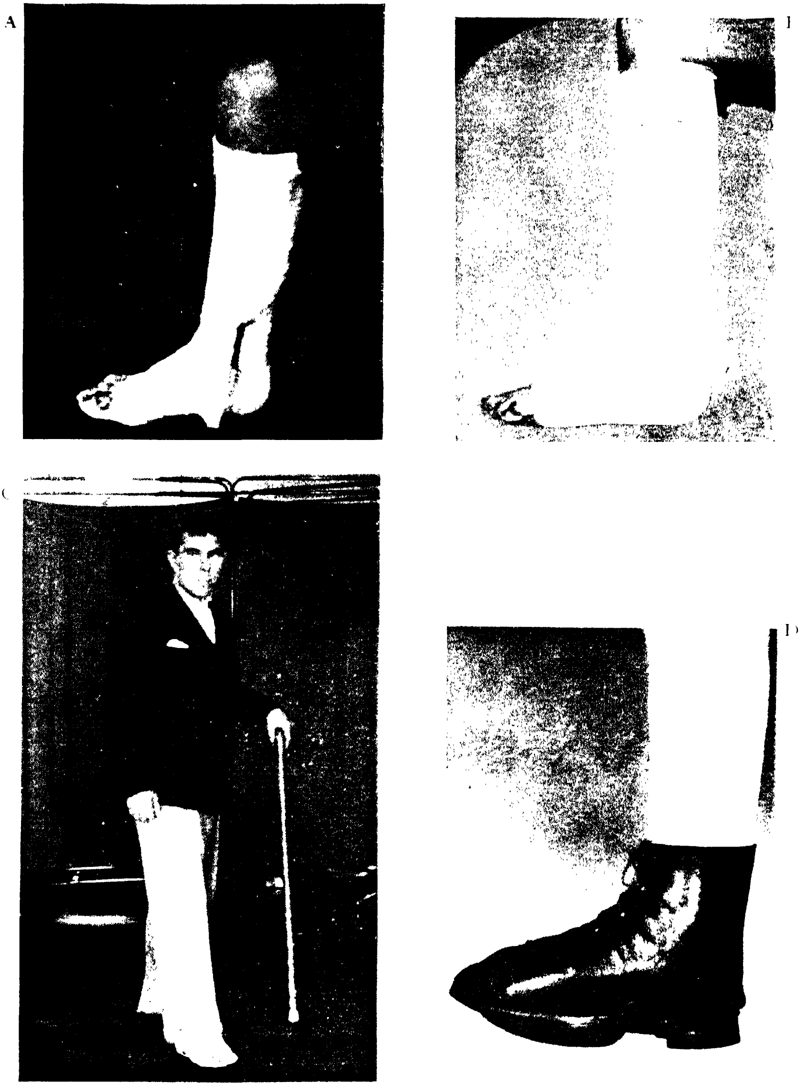


B. Intracapsular fracture of the neck of the femur.



C. The same fracture after insertion of Smith-Peterson pin by Hey-Groves method.

PLATE XXVI · TREATMENT OF FRACTURES

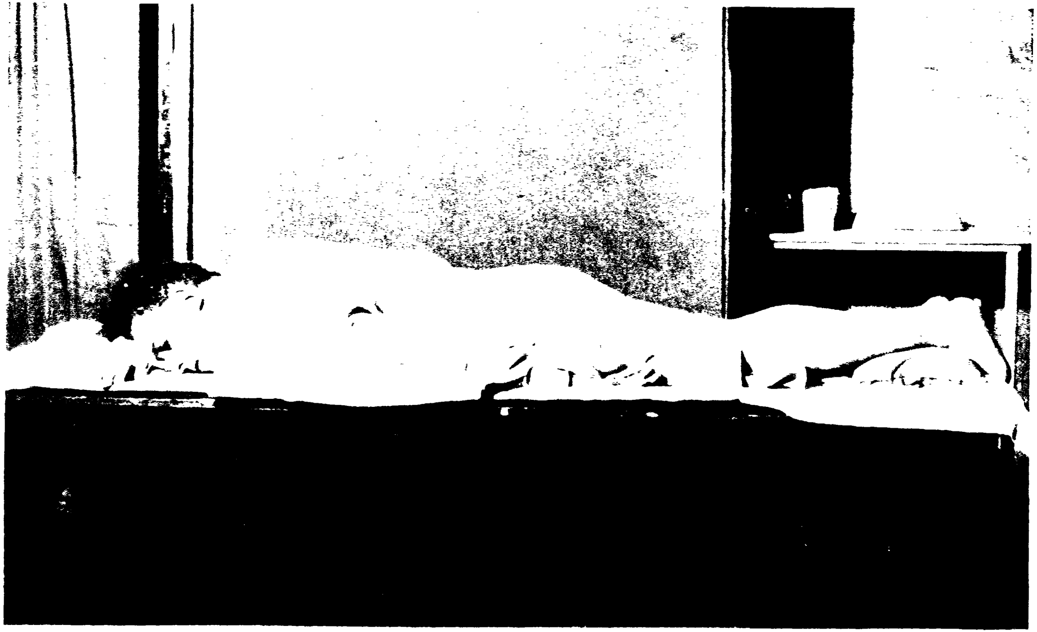


A. A Pott's fracture of the right ankle, treated after reduction by plaster, and a walking-iron. C. The same patient walking.

B. A Pott's fracture treated after reduction by plaster without walking-iron.

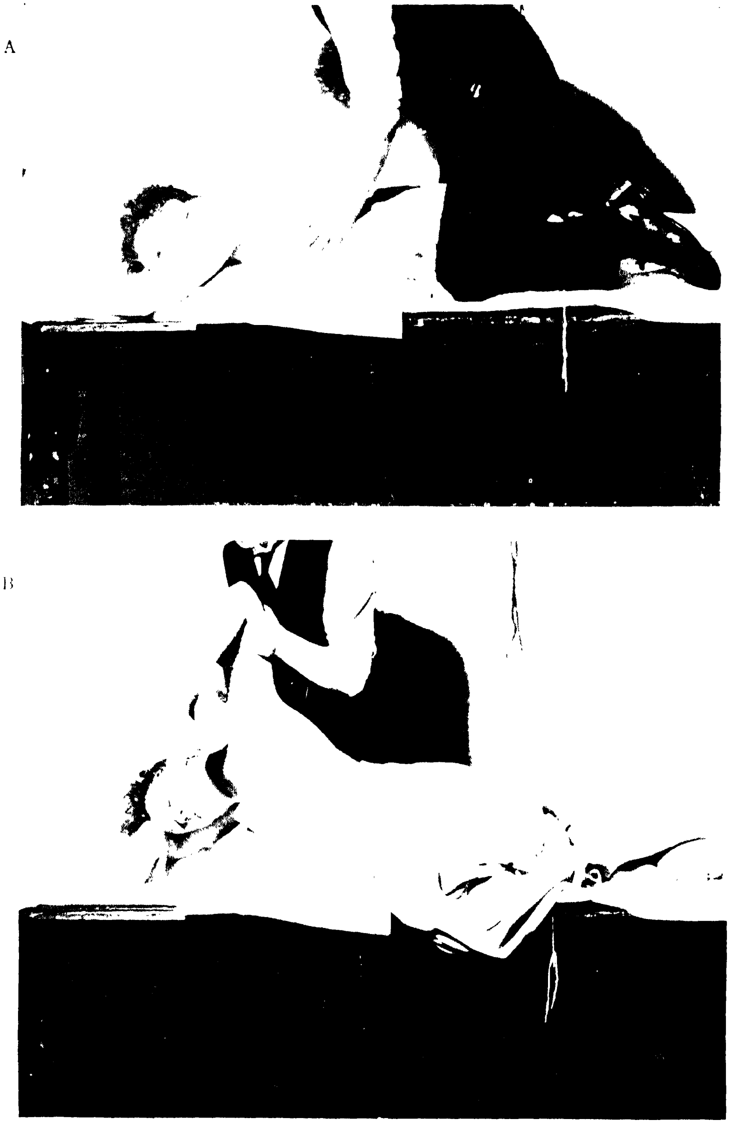
D. Walking-boot with rockered sole for use with plaster shown in B.

PLATE XXVII · UNCONSCIOUSNESS



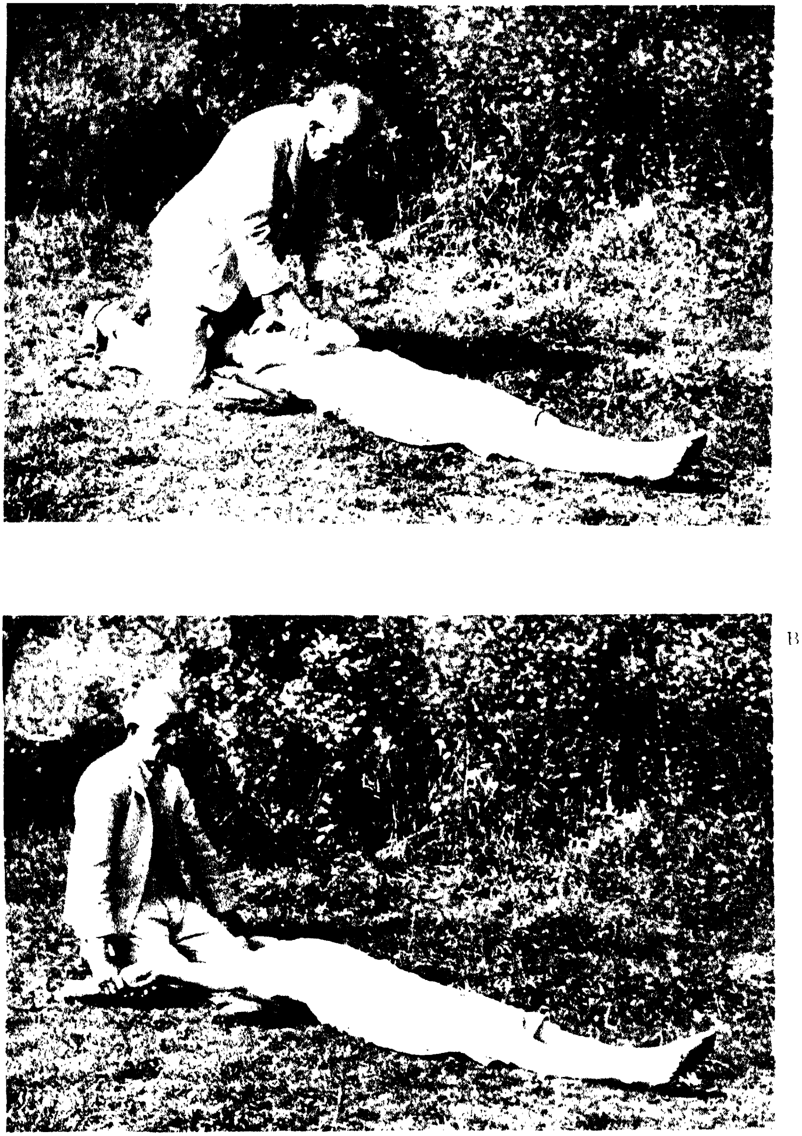
Schafer's prone position for unconsciousness.

PLATE XXVIII · ARTIFICIAL RESPIRATION



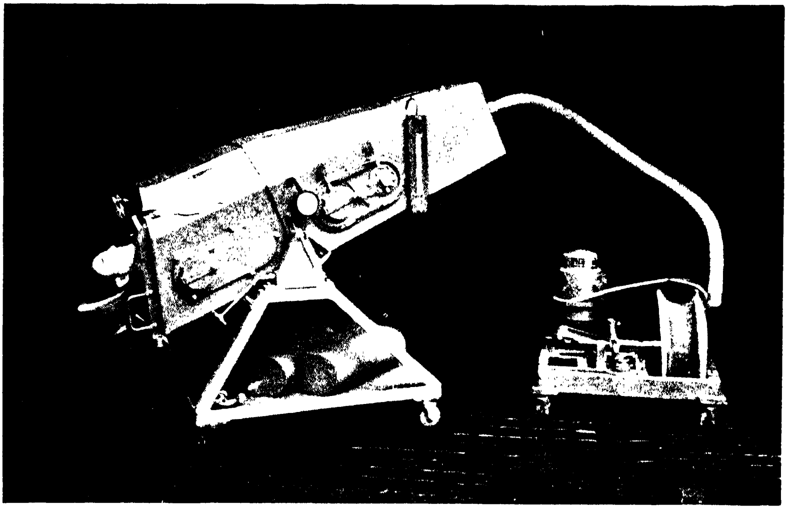
Artificial respiration by Schäfer's method. A, first position; B, second position.

PLATE XXIX · ARTIFICIAL RESPIRATION

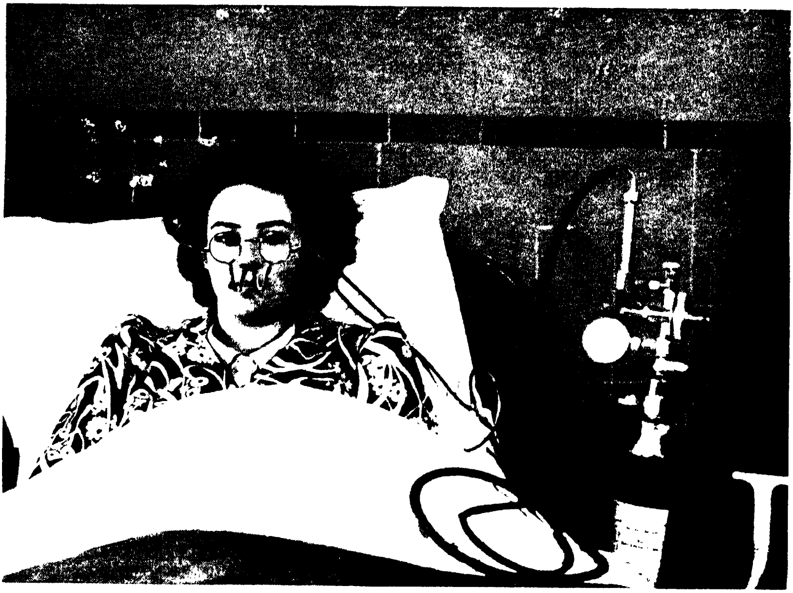


Artificial respiration by Sylvester's method. A, first position; B, second position.

PLATE XXX · IRON LUNG · OXYGEN SPECTACLES

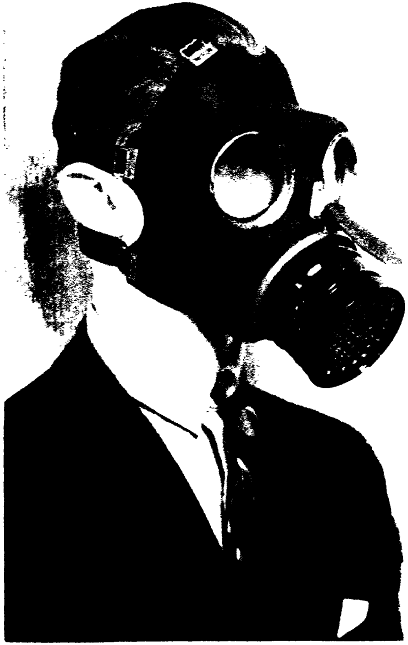


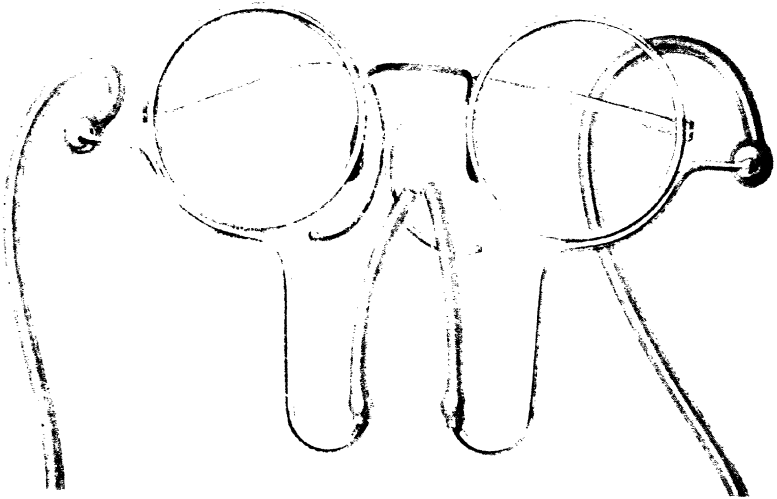
A. The Drinker respirator (iron lung).



B. Harrison's Orbito oxygen spectacles applied.

PLATE XXXI · GAS MASK · OXYGEN SPECTACLES

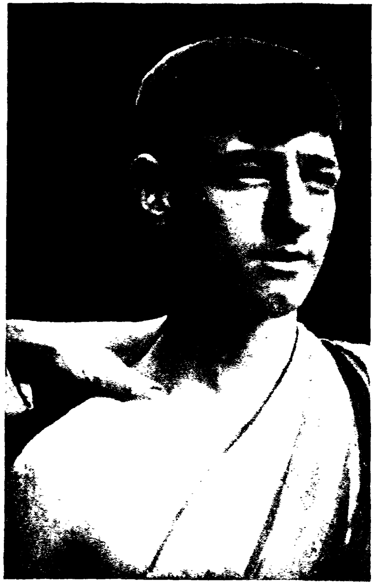




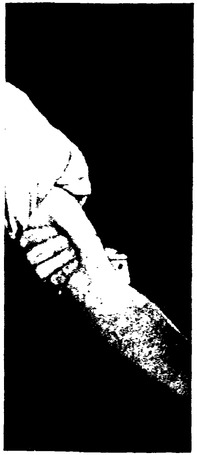
Left: The anti gas mask.

Above: Harrison's Orbito oxygen spectacles

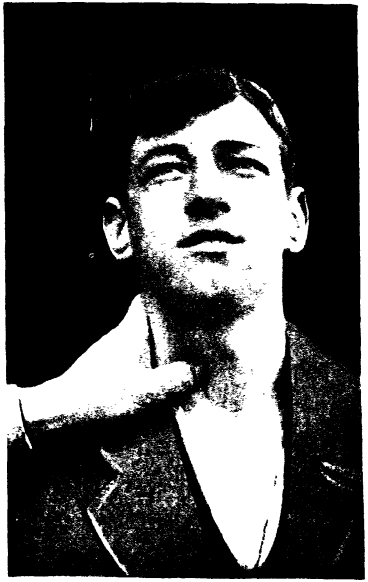
PLATE XXXII • COMPRESSION OF ARTERIES



A. Compression of the subclavian artery.



B. Compression of the brachial artery from behind.



C. Compression of right carotid artery.

Dressing.—The wound will probably require dressing daily, or more frequently, according to the amount of discharge present.

Nursing.—These patients require more constant attention and nursing during the acute stage than almost any other case. Only the most devoted and untiring care on the part of the nurse will enable them to pull through. Intense restlessness is one of the most distressing symptoms, it being often impossible to make the patient comfortable for more than a few minutes at a time. Infinite patience is required. Only small snatches of sleep are procured on account of the restlessness and hiccough; the latter is sometimes relieved for a time by the application of a mustard leaf (p. 94) to the epigastrium. Recovery depends on whether the patient's strength can be maintained until the toxaemia is eliminated. Once the bowels have acted well, and flatus is passed by rectum, the vomiting will diminish, the pain become less, the pulse become slower and stronger, the temperature more nearly normal, the restlessness and hiccough disappear, and the patient gradually recover.

(4) **Perforation.**—*Symptoms.*—The symptoms are: Sudden severe pain with shock (p. 561) and collapse (p. 562); subnormal temperature, rapid and small pulse, and pallid face. These symptoms if unrelieved are soon followed by those of peritonitis. The severity of the symptoms varies with the size and position of the perforation; should the affected area become shut off by peritoneal adhesions, the symptoms may be very slight.

The *treatment* consists in keeping the patient absolutely quiet, either flat, or propped up as ordered, according to the site of perforation. Shock is treated, and a laparotomy is performed without delay to repair the damaged part. (See acute abdominal operations, p. 500.)

(5) **Shock.**—For the symptoms and treatment see p. 561.

(6) **Sepsis.**—For the symptoms and treatment see p. 569.

The table (p. 514) *is useful to show at a glance the difference in symptoms between shock, internal haemorrhage, perforation, and peritonitis.*

(7) **Intestinal Obstruction, or Ileus,** is a condition of acute distension of the intestine due to strangulation of the bowel by adhesions, bands, or kinking of the bowel.

Symptoms.—The patient usually appears to be progressing satisfactorily during the first two days or longer, and is then seized with griping paroxysmal pain, nausea, and vomiting. The vomit is at first bilious, later dark and faecal (see vomit, p. 184). Later there is increasing distension of the abdomen and absolute

TABLE COMPARING THE SYMPTOMS OF SHOCK, INTERNAL HAEMORRHAGE, PERFORATION AND PERITONITIS.

	Shock	Internal or Concealed Haemorrhage	Perforation	Peritonitis
1. Consciousness	Completely or partially lost	Present, may be diminished or lost later	Present, may be lost later	Present
2. Faces	Pallid and shrunken. Lips blue. Nose extremely cold	Anxious expression, extreme pallor. Lips colourless	Anxious, drawn, and pinched. Lips blue	Anxious, drawn, and pinched. Pallid or flushed
3. Body	Quiet, cold. Profuse cold sweat	Restless, cold	Quiet, cold. Cold sweat	Restless, hot, or cold
4. Temperature	Sub-normal	Sub-normal	Sub-normal	Sub-normal or raised above 101° F.
5. Pulse	Small and weak; later, rapid, irregular, or imperceptible	Large-waved, soft and rapid; later, small, irregular, or imperceptible	Rapid, irregular, weak	Quick, hard and wiry; later, weak, irregular, and compressible
6. Respiration	Slow and shallow	Rapid, panting, air hunger	Slow and shallow	Quick, shallow, and thoracic
7. Abdomen	Normal	Flaccid	Fixed and rigid, tender, distended	Flat, rigid, and tender, distended
8. Pain	Absent	Present, but may be absent	Acute and sudden	Present, constant, and griping
9. Vomit	Present, clear; later bile-stained	Absent, or may be present and haemorrhagic	Occasional, bile-stained, or blood may be present	Constant, small or large quantity brought up without effort, later becoming faecal
10. Hiccough	Absent	Absent	Present, but may be absent	Present

constipation, although the faecal matter present in the bowel below the obstruction may be passed. No flatus is passed by rectum, a great deal being brought up by mouth. There is a steadily rising pulse-rate, with some rise in temperature, and the face assumes an anxious expression. These symptoms follow the vomiting and distension instead of preceding them as in peritonitis; they arise because the patient is being poisoned by toxins present in the bowel (p. 829).

Treatment.—Report at once to the surgeon, and prepare for an immediate laparotomy (see preparation for immediate operation, p. 505). The operation consists in opening the abdomen and releasing the constricted bowel, in severe cases enterectomy (p. 506) may be necessary.

(8) **Acute Dilatation of the Stomach** is a rare complication which is often fatal.

Symptoms.—The symptoms appear after the first 24-48 hours, the patient until then having been progressing satisfactorily. Pain of a bearing-down character is complained of; nausea and vomiting are present. The vomit is at first bilious, then becomes dark in colour and is brought up constantly in mouthfuls without effort. The abdomen becomes increasingly distended, but is not uniformly so. The pulse rises steadily and becomes small and weak, the temperature being subnormal. The face is drawn, pinched, and anxious, the patient having much the same appearance as a patient suffering from peritonitis (p. 512). Nothing can be retained by mouth, and the vomiting continues whether anything is taken or not; the patient becomes very collapsed, and within a few hours of the onset of the symptoms may appear *in extremis*. Rectal saline infusion increases the discomfort.

Treatment.—Inform the surgeon and prepare the apparatus for stomach washing out (p. 64). When the stomach has been emptied, it may be found to have contained several pints of the same dark-brown coloured fluid as was being vomited. The stomach may be so dilated as to reach the pubes. The patient usually suffers from collapse after the lavage, so that stimulants, strychnine, brandy, and saline must be in readiness.

Position.—The patient is kept flat in bed with the foot of the bed raised on high blocks, this is done to prevent the stomach sagging down and to assist in its return to a normal size.

Diet.—No food is given by mouth until the stomach becomes more normal in size, when semi-liquids in small quantities are given by mouth and are very gradually increased (see feeding of anastomosis cases, p. 507). Until food may be taken by mouth, rectal saline with glucose or white of egg is given every 4 hours.

The stomach is washed out twice daily, care being taken that it is emptied completely each time. The size of the stomach, or the point to which it extends when being washed out, should be marked on the abdomen daily, in order to see whether it is shrinking.

(9) **Parotitis.**—This term is applied to inflammation of the salivary glands. It is often caused by infection from a septic condition of the mouth which spreads along the salivary ducts. It is in many instances a preventable complication, and if the mouth is thoroughly and conscientiously cleansed by the nurse should not occur. The condition occurring from this cause reflects great discredit on the nursing. (For the symptoms and treatment see p. 216.)

(10) **Thrombosis.**—See p. 281.

(11) **Embolism.**—See p. 282.

(12) **Bronchitis.**—See p. 248.

(13) **Pneumonia.**—See p. 251.

CHAPTER XVI

FIRST AID AND AFTER-TREATMENT OF ACCIDENTAL WOUNDS AND INJURIES

WOUNDS

A WOUND is a solution of continuity occurring in one or more of the tissues of the body. Wounds may heal by first intention (primary union) or by granulation (second intention, p. 518).

Repair of Wounds.—1. Healing by First Intention, or Primary Union, occurs in cleanly cut aseptic wounds where the lips are unbruised and brought together, so that no extensive collection of blood or discharge between them is possible.

Method of healing.—(*a*) The first stage in the process consists in an abundant exudation of small round cells (leucocytes), whose function is to remove all dead and damaged tissue, as well as to break up, disintegrate, and absorb any blood-clot which is present.

(*b*) The exudation of these cells is followed by the appearance of a number of large oval cells, termed fibroblasts. These cells undergo organization to form fibrous tissue and blood-vessels. They form a layer of cellular tissue which lies upon, or between, the surfaces of wounds.

(*c*) This cellular layer is then vascularized in the following manner: From the walls of the nearest capillaries, solid rods of protoplasm appear. They bend over to unite with similar threads from other capillaries, and, after a time, these threads become canalized, a communication is established between them and a blood-vessel, so that blood passes into them. The new capillary wall soon becomes lined with endothelial cells, and strengthened by the connective tissue which forms around it. By this means a soft vascular tissue is produced, known as *granulation tissue.*

(*d*) This granulation tissue next becomes transformed into fibro-cicatricial tissue. Whilst this stage is in process, the surface of the wound is covered over with cuticle, which spreads inwards from healthy epithelium in the neighbourhood of the wound, and the wound is healed.

To promote healing by first intention the following points must be attended to: Arrest of all bleeding; sterilization of the wound and the surrounding skin (p. 437); the coaptation of the cut surfaces;

rest to the part; the application of an aseptic or antiseptic dressing; this last is not absolutely essential to healing by first intention, as if all other points have been attended to the wound may heal without dressing (see open method, p. 439), it is, however, usual and much safer to apply a dressing; the general health must be attended to.

2. **Healing by Granulation,** or Second Intention as it used to be termed, occurs in cases where there has been definite loss of substance, so that the edges of the wound are not, or cannot be, approximated; and also when the surface of the wound is damaged or bruised so that portions of tissue have to separate by sloughing; or when the wound has become infected and sepsis prevents healing by first intention. When there is a simple loss of substance with no bruising or damage to the tissues, healing takes place as follows: An exudation of plasma and leucocytes takes place from the adjacent vessels. The plasma coagulates on the surface of the wound and forms a layer of fibrin, entangled in the meshes of which are a number of white corpuscles, so that the wound becomes covered with a film of whitish-yellow material known as lymph. This gradually increases in amount and thickness, and is vascularized from below into granulation tissue. After a time the granulations become converted into fibrocicatricial tissue, and the surface becomes covered with cuticle.

3. **Healing under a Scab** is a process that only takes place in small superficial wounds and abrasions, and closely resembles healing by granulation, except that instead of an artificial dressing applied by the surgeon, the wound is covered by a scab which consists of clotted blood and dried exudation. Should the wound be septic, pus will probably accumulate under the scab, requiring the removal of the scab.

A **Scar** is a mass of fibroid tissue covered by epithelium, which has been formed in the repair of a wound. When superficial, its colour changes from red to white, and if of a small size may almost disappear.

An **Abscess** is a circumscribed collection of pus, formed or deposited in some tissue or organ.

A **Slough** is a portion of dead skin or mucous membrane and subcutaneous tissue surrounded by living tissue. A **Sequestrum** is a portion of dead, or necrosed, bone in living bone.

Varieties of Wounds.—*First aid* is the immediate treatment given by the nurse or other competent person until the arrival of the surgeon.

After-treatment consists in that given, or ordered by the surgeon and carried out by the nurse according to his instructions. (For general nursing, see p. 460; for treatment of haemorrhage, see p. 563.)

1. A **Contusion** is a subcutaneous wound which does not involve the skin. Signs: pain, swelling, bruising, discoloration.

First aid.—Apply cold or evaporating lotion (p. 93). Firm bandaging will prevent swelling and effusion of blood (haematoma).

After-treatment.—The cold application may be discontinued after 12 hours, and the part covered in wool and a firm bandage. If there is any likelihood of the skin sloughing, the part is purified (p. 437) and an antiseptic dressing is applied. Massage may be ordered later.

2. An **Abrasion** is an injury to the skin in which the scarf skin is destroyed and the true skin exposed.

First aid.—Wash the part with boiled water and apply compress of boiled water.

After-treatment.—The wound is dressed with Elastoplast, or gentian violet jelly.

3. **Incised Wounds** are wounds inflicted with a knife or other sharp-cutting instrument, the edges of the wound are clean and gape apart.

First aid.—If out of doors, arrest the bleeding by tying a clean handkerchief tightly over the part (p. 139); if indoors, immerse the cut in water either hot or cold until a clean piece of linen is procured, then apply the linen and bandage.

After-treatment.—The wound is purified, the edges are drawn together either by means of stitches or strapping, and an antiseptic dressing is applied. The wound is dressed and the stitches are removed in from eight to ten days, according to the position and condition of the wound (p. 440). Should the wound become septic the treatment on p. 569 is prescribed.

4. **Contused Wounds** are caused by blows from a blunt instrument such as a truncheon, club, etc. The edges of the wound are jagged and depressed, and the wound does not gape; the haemorrhage is slight, the surrounding parts are contused and swollen.

First aid.—Cleanse the wound with boiled water, and apply a clean piece of linen or dressing, bandage lightly.

After-treatment.—The wound is purified and an antiseptic dressing is applied. The part is kept at rest, the wound is dressed daily or oftener until healed.

5. **Lacerated Wounds** are caused either by crushing with a vehicle, by tearing with machinery, by cannon shot or shell, or by mauling by an animal. The surface of the wound presents a jagged appearance; the skin recedes, leaving the muscles and tendons exposed; the nerve ends hang loosely from the wound; the bone ends may protrude and have a jagged appearance.

First aid.—If haemorrhage is profuse apply a tourniquet (p. 566);

cover the wound with clean linen and bandage; if haemorrhage is not severe the wound should be covered and a tourniquet applied loosely so that it may be tightened if bleeding occurs (see haemorrhage, p. 563).

After-treatment.—Shock is treated (p. 561). After purification, the wound is repaired as far as possible and suitable dressings and splints are applied. Hopelessly damaged limbs are amputated (p. 475).

6. **Punctured Wounds,** or stabs, are caused by sharp-pointed instruments, such as bayonet, hatpin, needle, etc. The appearance of the wound varies according to the size and kind of the weapon. It is always relatively small and the edges are driven inwards.

First aid.—Cover the wound after withdrawing the instrument if left protruding from the wound.

After-treatment.—These wounds are particularly liable to become septic owing to the small aperture not allowing of drainage. The wound is purified and dressed. Signs of inflammation are watched for (p. 568), and if they supervene an operation is undertaken to open and drain the wound.

7. **Gunshot Wounds** caused by shot or shrapnel.

First aid.—Cover the part with a towel wrung out of hot water.

After-treatment.—Shock is treated (p. 561), the fomentation is renewed. Later, after purifying the skin, the surgeon may remove the superficial shot and apply a dressing (p. 440).

8. **Poisoned Wounds** consist of bites and stings from animals and insects.

Dog Bite.—*First aid.*—If the finger is bitten, tie a tape or string around the root of the finger, squeeze the blood towards the bite so as to get rid of the poison, suck the wound, spitting out the blood, or if hot water can be procured, hold the finger under running hot water.

After-treatment.—The wound is cauterized either with a fluid caustic such as pure carbolic acid, nitric acid, or any other strong acid, or the actual cautery (p. 96) may be used. Treatment by inoculation is given without delay if there is any suspicion of the dog being rabid (p. 585).

Snake Bite.—*First aid.*—Encircle the limb above the bite immediately by applying a tourniquet (p. 566); if a finger, encircle the root of the finger with a tight string; if a hand or foot, leg or arm, apply the tourniquet on the thigh or upper arm. Encourage bleeding by washing the wound in hot water, or sucking it, taking care to spit out the fluid. If the wound is on a part of the body or head where it is impossible to apply a tourniquet, encourage bleeding, then apply strong ammonia, or spirit, and as soon as possible get the wound treated by a surgeon.

After-treatment.—The wound may be cauterized, or a strong solution of crystals of permanganate of potash may be injected into and around the wound. All clothing must be loosened, as the limb frequently swells to a great size. Bites of centipedes and other venomous insects are treated in the same way.

Bee and Wasp Stings.—*First aid.*—Squeeze the part firmly to eject the sting and poisonous fluid, apply a drop of strong ammonia to the wound, or if this is not available, spirit, or the bluebag may be applied. If the sting is in the mouth, the patient should be made to wash the mouth with a strong solution of carbonate of soda, or the bite may be touched with a match dipped in strong ammonia. Care must be taken not to allow the ammonia to run over the patient's mouth.

After-treatment.—Severe constitutional disturbance may follow a sting. The patient complains of chilliness, is faint and pale. There may be palpitation of the heart, vomiting, swelling of the face, hands, and feet, and later delirium or unconsciousness. When any of these symptoms are present, put the patient to bed with hot-water bottles, apply a mustard leaf to the epigastrium, give sips of brandy and water, and send for a doctor.

Burns and Scalds.—A burn is a wound caused by dry heat; scalds are caused by moist heat.

Classification of burns.

(i) Partial skin loss or *superficial* burn, which includes 1st, 2nd, and 3rd degrees of Dupuytren's classification, i.e., 1st, superficial congestion of the skin without destruction of tissues; 2nd, the cuticle raised from the cutis, a blister resulting; 3rd, the cuticle destroyed, also part of the cutis, leaving nerve terminals exposed.

(ii) Total skin loss or *deep* burn, which may correspond to 4th, 5th, or even 6th degree, i.e. 4th, complete destruction of the cuticle, cutis, and some of the subcutaneous tissues; 5th, destruction of the skin, subcutaneous tissue, and muscle; 6th, charring of the whole limb, the tissues being burnt to the bone.

Scalds are injuries caused by heated fluids or steam. They are usually more extensive and also more superficial than burns, unless the fluid is a thick one, such as syrup or oil, which adheres to the skin. The treatment is the same as that given for burns.

Four essential factors require consideration before the treatment of the burn is dealt with, namely: (*a*) suffocation from smoke and fumes (see p. 547), (*b*) shock, (*c*) toxaemia, (*d*) sepsis.

(*b*) *Shock.*—When a patient is burnt or scalded there is a rapid bombardment of the central nervous system by impulses from the injured area, causing the symptoms of surgical shock—rapid fall in blood pressure, feeble pulse, sub-normal temperature, and cold clammy skin (primary shock). The severity of the primary shock depends mostly on the *extent* of the burn rather than on the *depth.* The greater the area involved, the greater the shock. Burns of the thorax, abdomen, and face cause more shock than burns of the extremities.

In an adult the relative skin areas are as follows:

Part of body	*Proportion of total skin area*
Trunk	38 per cent
Lower extremities	38 ,,
Head	6 ,,
Upper extremities	18 ,,

In children burns cause a greater proportion of shock, hence the mortality is correspondingly higher.

Secondary shock is a much more serious condition, and occurs as a collapse some few hours after the burn. There may be a definite interval between recovery from the initial shock and the development of secondary collapse, or the primary shock may simply merge into secondary shock. The symptoms are: thirst, vomiting, feeble rapid pulse, rapid shallow respiration, sub-normal temperature, cold clammy sweat (see also shock, p. 561).

An important factor in the causation of secondary shock is the great loss of plasma from the burnt surfaces into the tissue spaces.

Immediate treatment is necessary as no local treatment of the burnt area may be undertaken until shock has been treated.

(*c*) *Toxaemia,* due to absorption of toxins from damaged tissues and septic involvement of the burn area. If sepsis can be eliminated from burns toxaemia is very slight.

The *symptoms* vary with the severity of the condition. Amongst these persistent vomiting, rapid pulse, restlessness, delirium, and albuminuria may be present. Circulatory failure with rapid fall in blood pressure may be fatal.

(*d*) *Sepsis.*—In burns with partial skin loss, septic infection may be prevented provided local coagulation treatment (see p. 99) is given immediately after the injury, followed by adequate cleansing and coagulation when the patient reaches hospital. Burns with *total* skin loss are very prone to sepsis contamination, coming from the patient's own skin, or by droplet infection (p. 430). The treatment is by saline baths or irrigation envelope with Milton solution, described on p. 101.

First aid.—First treat shock. Place the patient flat with his feet higher than his head; apply warmth and feed with frequent hot sweetened drinks, keeping him quiet and at rest. The wound meanwhile can just be covered with a clean towel or cloth. If a doctor is available opium or morphia (gr. ½) will at once be given. This lessens the pain, and thus lessens shock. If the clothing is non-adherent it may be removed. If the patient can be treated in hospital within an hour the wound simply covered with a clean towel will suffice. If more than an hour will elapse before hospital treatment can be given the best first-aid application is either gentian violet jelly with merthiolate (1–5000), or triple dye jelly with sulphathiazole (see p. 99). The jelly is squeezed from the previously cleansed tube to cover the entire wound. Any blister is snipped beforehand with sterile scissors. The jelly forms a coagulum over the burn, and pain ceases. Care is needed to avoid touching the burnt area with unwashed hands, or breathing over it, to avoid droplet infection (see p. 98). Should neither of these jellies be available the wound may be covered with either cod liver oil or lard, excepting burns from phosphorous, Lewisite, and mustard gas (see p. 557.)

After-treatment.—*Shock.*—For the treatment of secondary shock, relief from pain, complete rest in the recumbent position, warmth, and the administration of quantities of sweetened fluids are necessary. Coagulation of the tissues is of great value because coagulation of nerve endings stops pain; coagulation of blood vessels stops loss of body fluid; coagulation of damaged tissue stops toxic absorption (see p. 522).

To replace the *plasma* lost from the blood intravenous infusion of plasma, or dried serum (see p. 77), restores the blood to the osmotic pressure required to maintain the normal distribution of fluid between the intravascular and interstitial compartments.

The inhalation of oxygen by the B.L.B. mask (Plate III) helps greatly in the reduction of shock.

Local treatments are fully described on p. 100, and nclude saline baths and treatment with irrigation envelopes.

Septic burns are treated with either of these methods. Skin grafting of the healthy granulating surface is undertaken when there is much loss of skin. X-ray therapy is used during healing if there is any tendency to keloid formations.

Electric burns differ from other burns in that they often leave very little mark, but penetrate deeply. The shape of the burn varies with the shape of the object carrying the electricity, but usually they are circular or elliptical, vary in size from a pin's head to a penny, in colour greyish white, with a raised periphery and depressed centre and no surrounding redness. They look glossy, feel smooth like parchment, and when on the fingers completely obliterate the papillary lines over the area they cover. These burns quickly become septic, as they destroy the whole thickness of skin. Small burns are treated with triple dye coagulation (see p. 91), large ones may be completely excised, followed by a whole thickness graft. Neuritis commonly follows these burns, and is difficult to cure.

Burns from Corrosive Fluids.—It matters little whether the burn is caused by strong *acid* or *alkali*, the *immediate* treatment should be to wash the burned area in running water. Then, after neutralizing the chemical, apply triple dye jelly (see burns, p. 91).

For acids—nitric, hydrochloric, sulphuric, etc.—use sodium bicarbonate, ʒj to a pint of water. Carbolic acid burns may be treated by applying methylated spirit.

For alkalis—caustic potash, soda, etc.—use citric acid (2 per cent), as it penetrates into the deeper tissues, and is, therefore, preferable to any other. Vinegar, ʒj to Oj, can be used as first aid until citric acid is available.

Burns of the Eye.—See p. 641.

Burns caused by mustard and Lewisite gases, see chemical warfare, p. 554.

Healing of Burns.—*Superficial* burns—1st and 2nd degree—heal quickly without formation of scar tissue. In 3rd-degree lesions, the granulating surface becomes covered with epithelium, spreading from the edges of the wound and from small epithelial islets which have escaped destruction, and the scar shows little tendency to contract. In *deep* burns, 4th to 6th degree, healing is slow and contraction with consequent deformity results unless skin and tissue grafting is undertaken early and contraction prevented by the application of suitable splints, extension, and movement of joints. Ulceration follows when the whole skin is destroyed; it is also treated by skin grafting (see p. 465).

Clothes catching Fire.—In the event of a person's clothing catching fire proceed as follows: Lay the person on the floor in such a position that the flames are uppermost—that is, if the front of the clothing is on fire, place the patient on his back and vice versa. Wrap a rug, blanket, overcoat, or tablecloth around him very tightly so that the flames are smothered. When the flames have been extinguished, proceed as described under burns and get medical advice.

Scalds of the Throat, as, for instance, when a child attempts to suck the spout of a boiling kettle. Apply hot fomentations (p. 90) over the front of the neck from the chin to the chest. Give the patient ice to suck, and keep him in a warm room well protected from draughts. Send for the doctor, and watch carefully for signs of obstructed respiration (p. 456), as should they supervene tracheotomy may have to be performed (p. 662).

After-treatment.—The child is nursed in a steam tent. Liquids are given by mouth, saline by the rectum. Nasal feeding may be necessary. Tracheotomy requisites should be in readiness as oedema of the glottis (p. 668) may supervene and cause suffocation.

Frost Bite.—Rub the affected part with snow or with a piece of linen dipped in cold water; continue the rubbing until signs of circulation are present. Do not apply heat or warm the part until circulation is established, or the part will die. If the frost bite is extensive and cannot be cured by these means, wrap the limb in cotton wool and apply a loose bandage, and keep the part elevated and protected from pressure. The skin should be purified (p. 437) before applying the cotton wool. Medical advice must be sought as soon as possible.

Foreign Bodies.—*In the eye.*—If the foreign body is under the upper eyelid, place the patient in a chair and stand behind him. Take a match, penholder, or bodkin and place it on the lid just underneath the eyebrow, slightly press it inwards, and at the same time take hold of the lashes and draw the lid upwards. This will expose the under-surface of the lid, when the foreign body can be removed with a handkerchief or soft paint brush. To remove from the under-lid, draw the lid down, when it will be easily seen. If the foreign body cannot be removed or is impacted in the cornea, drop in castor oil, cover the eye with a handkerchief or pad and bandage and get medical advice (p. 641).

In the ear.—Do not interfere with it. If a child, tie the hands so that the foreign body cannot be pushed in farther, and get medical advice.

In the nose.—Induce sneezing by smelling pepper; if this does not remove the foreign body, get medical advice.

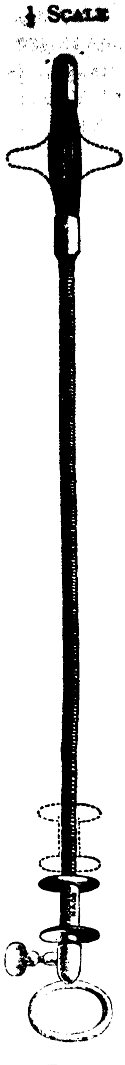


FIG. 204. Expanding probang for the removal of foreign bodies from the oesophagus. It is introduced closed as seen in the diagram, but in withdrawal is opened as shown by dotted lines.

In the oesophagus.—Give a meal of stodgy porridge, watch the motions to see if it is passed, and get medical advice. If the foreign body is sharp-pointed, cotton-wool sandwiches are given to the patient to eat. Cotton-wool sandwiches are made of thin crustless bread and butter with a layer of cotton wool between.

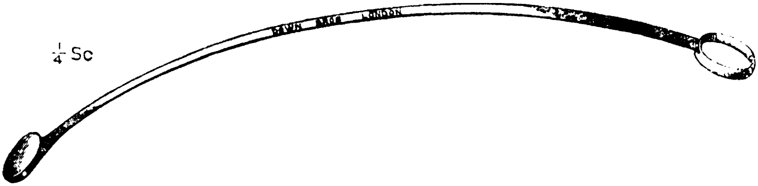


FIG. 205. Coin catcher. For the removal of coins from the oesophagus.

In the trachea.—If choking and a child, hold the patient by the legs with the head hanging down; this will probably dislodge the foreign body, if a bead or sweet. If there is no immediate symptom of distress, put the patient to bed and keep him quiet in a warm room. Send for the doctor.

In the throat.—Sweep the finger round the throat, hooking up the foreign body if possible. If unsuccessful, send for a doctor and meanwhile perform artificial respiration (p. 549) if necessary.

FRACTURES

A *fracture* (broken bone) may be defined as a sudden solution of continuity in a bone, usually resulting from external violence. It may be caused by (*a*) direct violence, (*b*) indirect violence, (*c*) muscular contraction, (*d*) 'spontaneous' fracture.

(*a*) **Direct Violence.**—When a fracture occurs at the spot where the violence was applied, it is said to be caused by *direct* violence.

(*b*) **Indirect Violence.**—When the fracture is due to some impact applied some distance from the spot at which the bone is broken, for instance, a fall on the shoulder resulting in a fractured clavicle, the term *indirect* violence is used.

(*c*) **Muscular Contraction.**—A fracture may be caused by violent contraction of the muscles which results in the bone snapping, the patella is frequently broken in this way.

(*d*) **'Spontaneous' Fracture.**—Occurs when the bone is diseased, the bone being broken as a result of the disease as in some cases of sarcoma.

The Different Kinds of Fracture.—1. **Simple** fracture is one in which the skin is unbroken (closed) and there is no communication between the site of injury and the air.

2. **Compound** (open) fracture is one in which the skin or mucous membrane is so injured that there is communication between the air and the fracture. The wound may be caused either by the injury which caused the fracture, or by improper handling of the part after the accident, causing the ends of the bones to be pushed through the skin (p. 528).

3. **Complicated.**—When important structures, such as arteries or a joint, are damaged, or as in the case of fractured ribs, when the ends of the bone are driven into the lung.

4. **Comminuted.**—When the bone is broken in more than two pieces.

5. **Multiple.**—When more than one fracture is present.

6. **Impacted.**—When one fragment is driven into the other.

7. **Incomplete** fracture is one in which the bone is not completely divided and may be of one of the following varieties:

(*a*) *Green-stick* fracture is one in which the curve of the bone is broken, the concave half being bent. Occurs most commonly in rickety children (p. 601).

(*b*) *Depressed* fracture is one in which the bone is bent in, occurs most commonly in the skull.

(*c*) *Sub-periosteal* fracture is one in which the bone is broken but the periosteum remains intact, displacement does not take place.

(*d*) *Fissured* fracture is one in which the bone is cracked, and is often not complete.

Complete fractures may be: (*a*) *Transverse*, when broken straight across.

(*b*) *Oblique*, when the break is in a slanting direction.

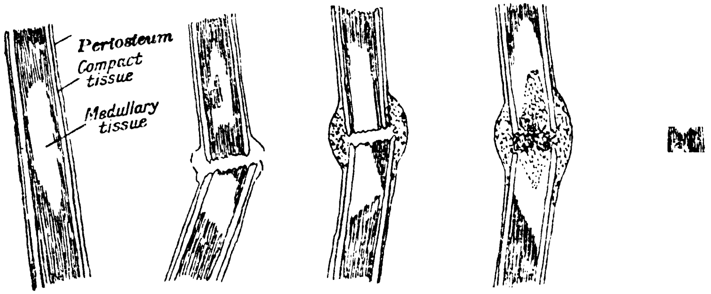
(*c*) *Spiral*, when the fracture extends round the bone as well as in its length.

(*d*) *Longitudinal*, when the bone is split in its length.

(*e*) *T-shaped*, when a longitudinal fracture is combined with a transverse fissure.

Signs of fracture.—Pain, swelling, bruising; complete or partial loss of power in the limb. The injured limb will be distorted in some way, and differ in appearance from the opposite side. If in a limb, movement is obtainable in the shaft of the bone as well as at the joint; but this sign should not be sought for by an inexperienced person. If the broken bone is just under the skin, the sharp edge of the fracture may be felt on gently passing the hand over it. When the limb is gently moved, a grating will be felt, due to the ends of the bone rubbing together; this is called *crepitus*.

Repair, or healing of bone.—See Fig. 206.—A long bone consists of compact tissue covered with a fibrous membrane containing many blood-vessels—the periosteum—whose function is to nourish the bone. Immediately after the fracture, the two ends of the bone are imbedded in blood clot due to the periosteum being torn. Inflammation in the surrounding tissues is caused by the injury and is followed by the formation of granulation tissue, see wounds, p. 517. Calcium salts are then deposited in this granulation tissue, the two ends of the bone being surrounded with a mass of soft sponge-like bone—callus. Callus is of two kinds, i.e. *provisional*, or temporary, cartilage-like, plastic material first thrown out, and which is ultimately absorbed; *permanent*, the callus forming the bond of bony union after re-absorption of the provisional callus.



Normal Bone — *Fracture, Periosteum torn* — *Temporary Callus formed, Periosteum joined* — *Temporary & permanent Callus* — *Bone united, Deformity*

FIG. 206. Healing of fractured bone.

General condition.—Shock is almost always present, varying according to the part injured and the amount of violence, from a passing faintness to complete prostration and insensibility (p. 561). Haemorrhage will be according to the site of fracture, but it is not often severe, except in the case of a compound fracture when a vessel has been injured (p. 527).

First aid.—Treat the shock (p. 561). Render the joint immediately above and below the seat of fracture immovable; this is done by the application of splints and bandages. Before applying the splints put the limb as nearly as possible into its natural position, except in the case of a compound comminuted fracture, when it is better to fix the limb without altering its position or the fragments of bone may cause further injury to the surrounding tissues on being manipulated (p. 527). Compound fractures must have a dressing applied before the application of the splints. Move the patient, carefully supporting the limb. Place him on a couch or bed with the injured limb supported and steadied by pillows and sand-bags.

When applying the bandages pass them under the natural hollows so as to avoid lifting the limb. The bandages or straps should be applied immediately above and below the fracture and not directly over it. The knots in the bandages must be tied at the side and not where the patient will lie on them.

Improvised Splints, Bandages, Sand-bags, etc.—The following improvised articles may be used for first aid:

Splints.—Walking-sticks, umbrellas, broom handles, rifles, straw envelopes of wine bottles, cricket pads, folded newspapers, cardboard, flexible books.

Bandages.—Handkerchiefs, strips of torn linen, etc., pieces of string, belts and straps, towels, bootlaces, etc.

Sand-bags.—Stockings filled with earth or dry sand.

Dressings.—Clean, soft rag, clean handkerchief, towel, etc.

General After-treatment and Nursing of Fractures.—The treatment of a fracture consists in reducing the fracture, that is, putting the bone in such a position that as it heals no deformity will result; fixing the limb, in order that accurate maintenance of reduction obtains until union is firm; *active* movements of the injured limb and all joints which are *free*, for full restoration of function.

Requisites when a fracture is to be 'put up.'—Bed prepared as a fracture bed, with fracture boards; splints, or plaster of paris for plaster cast; apparatus for extension (see extension, p. 150); pads; firm pillows; splint bands; roller bandages (p. 129), calico, and muslin; safety-pins; sand-bags; cradle if a lower limb; apparatus for local or general anaesthesia (p. 446).

Main principles.—The modern treatment of fractures comprises three main principles: absolute and immediate reduction, absolute and prolonged fixation, maximal functional use during the period of fixation.

1. Displacement is in every case reduced exactly and under X-ray control.

2. The reduction of most fractures is performed under local or regional anaesthesia (p. 444); the advantages are that it is simpler, lasts longer, produces better relaxation, and the reduction may be made single-handed.

3. The reduction should, whenever possible, be carried out as an immediate and single procedure, to be followed at once by fixation of the fracture site.

4. Absolute fixation of the replaced fragments until the fracture is firmly consolidated.

5. Minimal immobilization of the limb which, while controlling the fracture, allows maximal freedom and use.

6. The fullest possible restoration of movements, including (in the lower limb) weight bearing where possible while the necessary fixation is maintained.

Local anaesthesia.—Intravenous anaesthesia (p. 450) or local anaesthesia, described below, are ideal for reduction of fractures.

Technique.—A 2 per cent solution of novocaine is employed. A 20 c.c. syringe, with a long needle, is introduced through an intradermic wheal over the fracture, and pushed in until blood is withdrawn. The withdrawal of blood shows that the haematoma has been reached and the injection is now given. Within three minutes analgesia commences, and becomes total five or ten minutes later. The sites of the injection, the number of infiltrations, and the quantity of anaesthetic vary with the fracture.

The reduction.—*Technique.*—The accurate reduction of a fracture requires first, an exact appreciation of the deformity and of the several elements of displacement which constitute it; secondly, an understanding of the factors and forces responsible for the displacement; and thirdly, a plan of procedure which aims at the correction of all the elements of deformity and at the same time neutralizes the deforming forces.

In many fractures reduction can be effected without special apparatus, the deformity being corrected by manual traction and counter-traction, with direct manipulation of the fragments (forced movement) and the adoption of corrective positions (unforced movement). In other cases, exact reduction can only be obtained with the help of apparatus. Reduction apparatus only provides a means of applying immediate and powerful mechanical traction, and does not always obviate the need for direct manipulation, or for the adoption of corrective positions.

In difficult fractures *immediate* reduction by apparatus may be combined with skeletal traction (Fig. 207) the pull being exercised on a wire or pin inserted into the distal fragment, or into a convenient bone, e.g. the os calcis—distal to the fracture. The traction wire may either be removed after the reduction, or it may be left *in situ* and incorporated in the fixation plaster (p. 169) or used for continuous traction (p. 152) should this prove after all to be necessary. Every reduction should be confirmed by X-ray, and difficult fractures reduced under the screen.

The fixation.—The modern treatment of fractures is by the use of the unpadded plaster cast, introduced by Böhler of Vienna, which has rendered obsolete many of the other forms of splints and fixation appliances. The cast is a sandwich several layers thick, applied to the naked, unshaven limb or part, immediately after displacement has been reduced, and carefully moulded to fit the contours and bony prominences of the part: the reduction procedure is continued until the plaster has set quite firmly. With a well made cast, the fracture is rigidly immobilized, the patient is made completely comfortable and the limb can be used at once. For method of application see p. 162.

Considerable skill and experience is needed to attain success. The dangers are mainly those of vascular obstruction, but with experienced care they may be rendered negligible. Complete encasement of the fractured part is not always necessary, many fractures can be efficiently fixed with a cast which embraces two-thirds or three-quarters of the circumference of the limb. This type of cast is quite free from vascular obstruction.

After-treatment. — The plaster cast must not be taken off until the fracture is soundly consolidated, except when there are signs of vascular obstruction. In no circumstance is the removal of the cast allowed for massage or movements. Supported by an unpadded cast, the fractured limb soon becomes painless and comfortable and can be used to a surprising degree. Premature removal of the cast is always followed by curtailment of function, may cause return of pain and swelling, and, in the lower limb, is often responsible for non-union. The actual duration of fixation varies with the fracture, the patient's age and condition, and other factors, the average time will be found mentioned under each fracture.

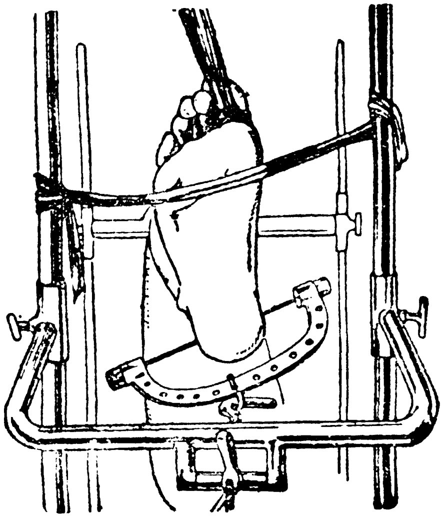


FIG. 207. Skeletal traction for reduction of a fracture. The leg is placed in Bohler's apparatus after a Kirschner wire has been introduced through the heel. Screw traction is applied from the Kirschner stirrup to the tension screw. A spring balance is used to prevent over-pulling. The foot is kept in the correct position thus: the pull is exerted on the outer side of the stirrup to invert the heel, the toe being slung from the cross frame.

Treatment before reduction.—If, for some reason, the fracture cannot be immediately reduced the following procedure is adopted:

(*a*) Any gross deformity is corrected by hand. This relieves kinking of blood-vessels and tends to prevent swelling.

(*b*) A firm bandage, e.g. Elastocrepe, should be applied over wool from the extremity of the limb to above the fracture site. This supports the tissues and prevents swelling.

(*c*) An adequate back splint should be applied.

(*d*) The injured part should be elevated above the rest of the body until complete reduction can be performed and the fixation cast applied.

Nursing.—When the surgeon has fixed the limb, it is the nurse's duty to see that the required position is maintained, that the bandages remain firm but do not become too tight, and that all the apparatus in use keeps in place and in working order.

When making the bed the limb must be carefully supported with two hands, when it is necessary to raise it. If extension is applied, the weight should not be lifted unless traction is made on the limb, otherwise, if there is much muscular spasm, the ends of the bone may become displaced; therefore instead of lifting the weight, raise the limb carefully, keeping it in such a position that the weight is pulling in the same line; in this way if a pulley is in use the extension is kept up continuously and no harm will be done by raising the limb.

Unless continuous traction is required, patients treated by the Böhler method of unpadded plaster casts (p. 162) are not kept in bed beyond a day or two. Whatever method is employed for accurate maintenance of the reduced fracture, active movement of the injured limb and all joints that are free should be encouraged as soon as possible, but passive movements, heat, and electricity should not be used until union is firm.

Operations on fractures.—Certain fractures cannot be completely reduced and accurately maintained without operation, these include: fractures of the patella, olecranon process, and of the ulna with separation of the fragments; fractures of the neck of the femur; fractures involving joints, when the displaced fragment cannot be reduced; fractures which have not united, and compound fractures. Operation consists in either wiring the fragments, or inserting a pin (Smith Petersen pin), or fixing plates or bone grafting (p. 473) to secure the bone and keep the ends in apposition. (For preparation and treatment see p. 460).

The bandages may become slack, or too tight, owing to the swelling of the limb being less or more; in either case the nurse must report to the surgeon so that they may be readjusted. Bed-sores, splint sores (p. 18), and plaster sores should be carefully guarded against. Should the patient complain of the splint persistently hurting in one place, the surgeon should be informed, as it will probably be necessary to remove the splint or cut a window in the plaster to relieve the pressure.

Compound fractures may require dressings in addition to the above treatment, they are usually put up in a plaster cast that allows of the wound being dressed without removal of the splint. In many cases operation is found to be necessary and consists in either wiring or fixing plates to secure the bone and keep the ends in apposition. (For preparation and treatment see p. 460; for dressing of wounds see p. 440.)

Unfavourable symptoms are: Blue toes or fingers, cold and numbness, if a limb, swelling, persistent pain, temperature above 100° F., cough and dyspnoea.

Complications of Fractures.—1. The joint may be involved and become distended with blood and synovial fluid and very painful.

2. Dislocation may be present as well as fracture.

3. Veins may be lacerated and thrombosis (p. 281) result; nerves may be injured, causing paralysis (p. 361) which may recover if the nerve is not completely severed, or if neuroplasty (p. 471) is performed. These cases are particularly susceptible to pressure sores (p. 18) and they may occur without any pain owing to the loss of sensation in the limb. Nerves may also be pressed on by callus as it forms, causing the same symptoms.

4. Hypostatic pneumonia (p. 257) frequently occurs in elderly people kept in the recumbent position for any length of time, so that if the leg is broken, these patients are usually put up in plaster of paris or some suitable splint and allowed to be up and get about on crutches.

5. Crutch palsy (p. 367) may occur through pressure on the brachial nerves. To prevent this, the crutch should be well padded and a handle applied.

6. Ischaemic contraction may result, and is due to splint pressure, it occurs most often in the forearm.

7. Ununited fracture. The fracture may be absolutely ununited, or partially and badly united and a false joint produced. This may be due to a malignant growth, or the ends of the bone becoming covered with cartilage. It is usually caused by the fracture having been displaced after fixation, due to muscular spasm or to careless movement of the part. An operation (p. 473) is usually needed to repair the bone, screws or plates or bone graft being used to keep the bone in position. Bier's treatment (p. 104) is often tried before resorting to operative treatment.

8. Sepsis (p. 569) if the fracture is compound.

Fracture of the Skull.—Fracture of the skull may be simple or compound, and may affect the vault or the floor (base). Fractures of the vault are most commonly caused by *direct violence*, such as a fall or a blow on the head, and are most often compound. Fracture of the base is often caused by *indirect violence*, such as a fall on the feet or buttocks, when the force is transmitted upwards along the spine to the occipital bone.

Symptoms.—The symptoms vary considerably according to the site of fracture and the amount of injury or shock to the brain, and whether the patient is also suffering from compression. The patient is usually unconscious, a wound may be present on the scalp, or there may be a discharge of blood and cerebro-spinal fluid from the nose or the ears, or suborbital haemorrhage. Compression of the brain (p. 546) will result in paralysis of the opposite side of the body, and may include the face; the breathing is deep and stertorous (p. 205), the pulse (after recovery from shock) is full, bounding, and *slow*. Eye symptoms include conjugate deviation (p. 209), squint, unequal or irregular pupils. Loss of consciousness supervening a few hours after the injury usually denotes compression due either to haemorrhage or a depressed fracture (p. 527).

First aid.—Cover the wound with a clean handkerchief or dressing, also the ears if discharging. Open the mouth and remove any false teeth if present. Keep the patient flat, with the head turned to one side, and lift on to a stretcher to move him. To place him on a stretcher, roll a blanket or rug beneath him, then lift him on the rug. (See treatment of unconsciousness, p. 545.)

After-treatment.—Having sent for the surgeon, place the patient in bed lying flat, with the back to the light in a darkened room. Undress him carefully with as little disturbance as possible and cover with warm blankets, place well-protected hot bottles near, but not touching, the feet. Nothing must be given by mouth until the patient becomes conscious. Rectal saline infusion (p. 58) may be ordered to counteract shock. The scalp wound is dressed by the surgeon after the necessary shaving (p. 438) and purification (p. 437). If there is any discharge from the ears, they are syringed (p. 645) with carbolic (1–20), and a strip of gauze wrung out of perchloride of mercury (1–2000) is placed in the meatus and a pad and bandage are applied. An ice-bag or ice-compress may be applied to the head and warmth to the extremities; an electric thermal pad is useful. Operative treatment (p. 477) may be necessary if the fracture is a depressed fracture, or if there are any signs of compression due to haemorrhage (see compression, p. 546)

The bowels are kept freely open, calomel may be prescribed, or one or two drops of croton oil in glycerine or butter if the patient is unable to swallow. Rectal feeding (p. 58) is given until the patient is able to swallow, or nasal (p. 55) or oesophageal feeding (p. 54) may be ordered. The *diet* is of milk; no stimulants such as soups, beef tea, etc. As the patient recovers, the diet is gradually increased but is restricted for some time.

Nursing.—Temperature, pulse, and respiration are taken every four hours or oftener. Bedsores are to be carefully guarded against (p. 17). Incontinence of faeces and urine may be present. It is convenient to place the patient in bed with his feet at the head of the bedstead and his head at the foot, or remove the bed head-rail if detachable, as this renders the wound more accessible; also, should the patient become restless, there is less fear of injuring his head against the frame of the bedstead. A specimen of urine should be put up as soon as possible and tested, and for this it will probably be necessary to pass a catheter (p. 66). The room is kept absolutely quiet, no visitors are allowed until the surgeon gives permission. Any sign of weakness, or paralysis, twitching, spasm, and rigidity must be reported at once. (Nursing of brain diseases, see p. 374.)

The *complications* are: Shock (p. 561), compression (p. 546), septic meningitis (p. 375), haemorrhage (p. 563), delirium (p. 359).

Fracture of the Lower Jaw.—*Symptoms.*—The symptoms are: Pain on movement of the jaw; irregularity of the teeth; haemorrhage from the gums; crepitus when any movement is made; dribbling from the mouth; difficulty in breathing, eating, speaking, or swallowing.

First aid.—Immediate treatment to save life is to see there is no obstruction in the airway which may arise from the tongue falling back, blood clot, or foreign bodies, teeth, etc. If there is respiratory obstruction the tongue should be pulled forward, holding it in a dry cloth, and the pharynx cleared with the finger of any blood clot or foreign bodies.

In order to prevent the tongue falling back again, or blood collecting and clotting in the pharynx, the patient should immediately be placed in such a position that his head points towards the ground, i.e. prone position, or sitting with head forward (see Plate V). The lower jaw is then fixed to the upper by means of Elastoplast taken from one temple under the chin—at the angle of the jaw—up to the temple on the other side, or a barrel bandage (Plate V) may be applied.

The support applied must always be *upwards*, never *backwards*, for a backward pull will always tend to embarrass respiration and increase displacement; for this reason a four-tailed bandage is never to be used.

After-treatment.—The fracture is fixed by surgical means—

wiring, pin, splint, or other methods. The fracture may be compound, and require external dressing. The mouth is cleansed by irrigation after each meal, using a Higginson syringe and either soda bicarbonate (ʒj–Oj), Eusol, or Milton. The patient may also use a mouth wash and a specially soft toothbrush. The food is liquid and nourishing, given every 2 hours, later semi-solids, mince, purée of vegetables, custard, etc. Liquid food is given by means of a feeding cup with rubber tube attached (p. 55), which may be passed between a gap in the teeth. In an uncomplicated case the bone usually heals in 5–6 weeks.

Fracture of the Clavicle.—*Symptoms.*—The upper limb is helpless, the patient usually supports it at the elbow by the hand of the sound limb; an irregularity may be felt on passing the fingers along the collar bone. This fracture occurring in children is often of the green-stick variety (p. 527).

Cause.—Direct or indirect violence, in the latter a fall on the hand or elbow.

First aid.—Place a pad in the axilla and bandage the arm to the chest, the fingers of the hand resting on the sound shoulder.

After-treatment.—The modern standard treatment is known as the 'three-handkerchief method.' Two handkerchief slings are applied around each axilla, and tied together at the back, by which the shoulders are kept braced back. To prevent friction and soreness, padding is placed in each axilla. The point of the elbow is rested in a handkerchief sling (Fig. 91). Movements of the wrist, elbow, and shoulder are started from the beginning, and it is usually only necessary to retain the slings for a period of 3 weeks (see Plate XXIV).

Fracture of the Ribs.—*Causes* are: Direct violence from a blow on the chest, indirect violence when the chest is crushed between two solid bodies.

Symptoms.—The symptoms are: Severe pain on deep breathing or coughing; the patient can usually indicate the spot where the fracture has occurred; crepitus may be felt when a deep breath is taken. If the lung has been injured, small quantities of bright red frothy blood may be coughed up (p. 259), or air may have escaped from the lung into the tissues under the skin (surgical emphysema), when a peculiar crackling sensation (crepitus) will be felt on placing the hand to the side.

First aid.—When the lung is not injured undo the clothing, apply a broad bandage 6 inches wide around the chest, beginning at the upper part. If triangular bandages are used, they must be folded into the broad bandage (p. 140) and tied firmly around the chest, the lower half of one bandage and the upper half of the other covering the seat of pain; the ends are brought round the chest to the opposite side and tied on the sound side in a line with the nipple. The lower part of the bandage should be pulled sufficiently tight to give comfort by its support to the patient and so enable a shallow breath to be taken without pain. When the lung is injured, do not apply a bandage to the chest, but lay the patient down, incline him towards, but do not roll him on to, the injured side; give ice to suck.

After-treatment.—These fractures cause much pain in breathing, which is prevented by applying Elastoplast strapping firmly around the lower part of the chest after deep expiration. This applies, whatever the site of fracture. An injection of 2 per cent novocaine into the site of the fracture will relieve severe pain while the strapping is being applied. A firm flannel bandage is then applied. The strapping is kept on for 3 or 4 weeks. Bronchitis is a common complication and expectorants are usually prescribed. Strapping the chest on the affected side only is now considered useless. If the lung is injured, the patient is placed flat in bed with a sandbag between the shoulders and the arm bound to the affected side. Slight cases in which there is no likelihood of injury to the lung or other complications may not be kept in bed.

Fracture of the Humerus.—*First aid.*—Secure the upper arm to the patient's chest over his clothing by a broad bandage, sling the forearm, leaving the elbow hanging down to act as extension.

After-treatment.—Fractures of the upper and middle third of the shaft are treated by application of a U plaster cast, fully described on p. 167. Fractures of the lower third have a forearm cast applied in addition to the U slab. Fracture of the *surgical neck* of the humerus may be treated without splint or plaster. After reduction a crêpe bandage is applied to the upper arm, the forearm supported in a collar and cuff sling which is worn day and night (Plate XXIV). Gentle manipulation and movement are commenced on the second day or later, resulting in better movement and less muscle wasting.

Disabilities following a fracture of the shaft of the humerus may be: (1) Limited movements of the shoulder, elbow and hand. (2) Pain. (3) Weakness of the arm from muscle wasting.

Fixation.—4–6 weeks.

Fracture of the Lower Arm (Olecranon).—*Symptoms.*—The elbow is powerless and cannot be straightened, a gap may be felt in the bone at the back of the elbow.

First aid.—Put on a straight splint so that the arm is kept straight.

After-treatment.—These cases are usually treated by operation (p. 473). Straight splints are used, or plaster cast, and the arm kept extended.

Radius and Ulna.—If both these bones be broken there will be the ordinary signs of fracture, but if only one there will be great difficulty in diagnosing the fracture until it has been X-rayed. If the patient has had an injury and there is pain and swelling, treat it as a fracture of both bones.

First aid.—Bind the forearm with the thumb pointing upwards, then apply a splint from the front of the elbow to the palm, and another on the outside from the elbow to the back of the hand; tie them firmly in place, and support the hand and elbow in a large arm sling.

After-treatment.—After complete reduction an unpadded plaster cast is applied, see the standard Colles's plaster, p. 165. Difficulty in maintaining accurate reduction may necessitate inserting a ' pin ' or wire into the upper end of the ulna and through the lower end of the radius and ulna, and, after reduction, the pin is incorporated in the plaster cast.

Fixation.—6 weeks. Active movements of fingers and shoulder started at once. Splints used: Straight splints, rectangular, jointed angular (p. 157), arm sling (p. 143).

Colles's Fracture is a fracture of the lower end of the radius, generally caused by indirect violence such as a fall on the hand.

Symptoms.—The symptoms are: Swelling, deformity, but the signs are not always convincing.

First aid.—Put up as for fracture of ulna and radius.

After-treatment.—After reduction the standard Colles's plaster (p. 164) is applied, fixing wrist. Active movements of fingers, elbow, and shoulder are started at once. Light work is commenced in 4 days.

Fixation.—4 weeks. Splints used: Carr's (p. 157), arm sling (p. 143).

Fractures of the Fingers or Palm of the Hand.—*Symptoms.*—The usual signs (p. 527).

First aid.—Place on a broad splint and bandage firmly.

After-treatment.—A plaster slab is applied to the dorsum of the hand and forearm, and fixed with a wet gauze bandage. A ventral slab is then applied, extending from just behind the metacarpophalangeal joint on the palm to the bend of the elbow (p. 169). A Cramer wire splint ¾ inch wide, bent into a wide U-shape, is padded with adhesive felt on its convex surface, and one end is incorporated in the ventral slab and so fixed that the distal limb of the ' U ' extends at least 1½ inches beyond the tip of the finger, see Fig. 139. A Kirschner wire is then introduced through the pulp of the finger and extension applied from this to the extremity of the Cramer's splint. Extension is applied for 3–4 weeks, after which active movements are commenced. If there is no displacement, the finger is flexed round a 1½-inch gauze bandage and strapped in this position with a strip of Elastoplast. Active movements of uninjured fingers, wrist (unless fixed), and shoulder are started at once.

Fixation.—Plaster, 3–4 weeks. Strapping, 2 weeks (Fig. 140).

Fractures of the Lower Limbs.—Femur.—Fracture of the neck or shaft of the femur may occur. Fracture of the neck usually occurs in old people and may be produced by a very slight amount of violence, such as missing a stair, tripping on a carpet. Fracture of the shaft occurs at any age and is caused by great violence, which may be direct or indirect (p. 526).

Symptoms.—The usual signs of fracture (p. 527), the leg is everted.

First aid.—Apply two splints, one on the inner, the other on the outer side of the thigh; then a long splint reaching from armpit to the foot, securing it with a bandage above and below the fracture, tie another bandage at the feet, another at the hips, and one at the upper end round the chest. The two feet must then be tied together, this makes use of the sound limb as an extra splint. A long-handled broom, a rifle, or two billiard cues may be used as splints. Keep the patient lying down and move him on a stretcher.

Fracture of the neck.—The modern treatment is by means of an operation, a special ' pin ' (Smith Petersen) is driven into the neck of the femur (Plate XXVc). Post-operative nursing and treatment is given fully on p. 473. In cases when the patient is old and any form of reduction and treatment is impossible, traction by means of a ' pin ' inserted through the tibia may be possible and will relieve pain and so allow later of further treatment as the patient's general condition improves. Later a full-length walking plaster cast may be applied (p. 174).

Fracture of the shaft.—These fractures are treated by skeletal traction on a suitable splint, either Hodgen, Thomas, or Braun, with the knee flexed, or on a Pearson fracture bed. Skeletal traction (p. 152) is followed by strapping extension after four weeks to prevent weakness of the knee joint. Movements of all joints except the knee are encouraged from the beginning. A box at the foot of the bed and pulley at the head allow the patient to raise himself for attention to his back, drawing-sheet, etc. If X-ray examination shows union to be progressing satisfactorily, gentle movements of the knee are commenced after 4–5 weeks. Weight bearing is not allowed until X-ray shows firm union which may take from 2–4 months. To relieve swelling which often occurs when the patient gets up, the leg is firmly strapped with Elastoplast from the foot to the knee.

Fracture of Tibia and Fibula.—*Symptoms* are those described under fracture (above). *Cause.*—Direct or indirect violence.

First aid.—Apply one splint on the inner and another on the outer side of the leg, tie firmly in position with bandages secured above and below the fracture. Walking-sticks, umbrella, or policeman's truncheon will form good splints for this fracture.

After-treatment.—Fractures of the shaft with little displacement are treated after reduction by a plaster cast—mid-thigh cast (p. 174). When displacement is marked, skeletal traction through the os calcis (Fig. 207), or a double transfixion by pins through the upper and lower ends of the tibia incorporated in the plaster, is employed. A walking-iron incorporated in the plaster cast or plaster boot (Plate XXVI) enables the patient to walk about from the beginning. Comminuted fractures of the lower third of tibia and fractures of mid and upper third of tibia are treated with the full-length walking-cast.

Fixation.—8–10 weeks or longer.

Pott's Fracture.—Is a common injury consisting of fracture of the lower end of the fibula, accompanied by either a fracture of the top of the internal malleolus, or rupture of the internal lateral ligament, with a dislocation of the ankle joint.

Cause.—Indirect violence, i.e. slipping and twisting the foot.

Symptoms.—The symptoms are: Pain, swelling, and deformity; the leg will not be shorter as the tibia is not broken across, the dislocation of the ankle causes considerable deformity.

First aid.—As for tibia and fibula.

After-treatment.—After reduction the limb is enclosed in a plaster cast, usually the standard below-knee cast (p. 170). A walking-iron may be incorporated in the plaster splint, or a plastic walking-boot is worn, and the patient starts walking immediately. Complicated cases may require wiring or other surgical fixation. After removal of the plaster, active exercises are necessary for the foot to prevent flat-foot.

Fixation.—4–10 weeks.

Fracture of the Patella.—*Causes.*—Commonly due to muscular spasm.

Symptoms.—The symptoms are loss of power in the limb, impossibility of straightening the leg, swelling of the knee, a gap may be felt on passing the fingers over the patella.

First aid.—Lay the patient down. Apply a splint to the back of the leg from the thigh to beyond the foot. Tie both feet together, and keep them raised.

After-treatment.—This fracture is commonly treated by operation. The torn ligaments are sewn and the separated fragments surrounded by a suture of silk which is firmly tied. The limb is placed on a back splint. On the eighth day skin sutures are removed and an unpadded plaster cast is applied (p. 174). The patient is then allowed up and walking. After removal of the plaster cast, an Elastoplast bandage is applied to the knee joint. The elastic bandage is discontinued in four weeks and full movement of the knee joint is usual. If not treated by operation a plaster cast is applied at once.

Fixation in plaster.—4–5 weeks.

Fracture of the Pelvis.—*Causes.*—Either direct or indirect violence.

Symptoms.—The symptoms include inability to stand, severe pain, and inability to move the lower limbs freely when lying down.

First aid.—Place the patient lying down on his back, with the knees over a pillow, or rolled rug, bind the knees together, lower limbs either straight or flexed according to which gives the most relief. The upper part of the body may be raised or not as desired by the patient. Place a broad bandage around the pelvis and tighten it sufficiently to give support. Roll a rug or blanket under the patient with as little movement as possible and lift him by means of the rug on to a stretcher.

After-treatment.—Place the patient in bed on a divided mattress (Plate II). Shock is then treated (p. 561). A catheter should be passed (p. 66) to empty the bladder, the patient must be warned on no account to pass urine, however great the need, until the surgeon has ascertained if the urethra has been damaged. An examination is also made to see if any of the visceral organs have been damaged. In simple fractures with little or no displacement, a firm pelvic binder is applied, the knees are tied together with a pad of wool between and flexed over a knee pillow. For fractures with displacement involving the front and back of the pelvic girdle, skeletal traction (p. 252) is employed. Traction pins are inserted through the lower end of the femur, or the upper end of the tibia for four or five weeks, this is followed by skin traction for two or three weeks and is applied to both limbs. The limbs are placed in a Braun splint (Plate VII). A hammock sling around the pelvis aids in bringing the fractured bones together. Active movements of all free joints are carried out from the beginning, no passive movements are allowed. The extension apparatus is arranged so that free movements of the legs are practised daily and exercises for the back made possible. If the urethra is damaged, a catheter is usually tied in, or a perineal opening may be made.

Nursing.—Great care is needed in the nursing of these patients. No movement should be allowed. If a divided mattress (p. 24) is used, the back can be washed and attended to, and the bedpan given without moving the patient. When changing the under-sheet, two nurses should lift the patient on a drawsheet (p. 29) whilst a third nurse rolls the sheet into position. Bedsores should be carefully guarded against and reported at once to the surgeon should they occur. Careful measurement of the urine must be recorded, the bowels should be opened daily with an enema if necessary (p. 62). The patient is kept in bed for eight weeks or longer, but is usually allowed to move about in bed after six weeks.

Complications.—The complications which may be present are injury to the visceral organs, especially the urethra, bladder, and rectum. Rupture of the bladder may occur and result in pelvic or intra-peritoneal extravasation of urine. Later, bedsores (p. 17), cystitis (p. 245), sepsis (p. 569), or abscesses (p. 518) may supervene.

Fracture of the Spine.—The cause is usually direct violence. The fracture may be simple (without injury to the cord) or complicated (when the cord is involved), which is much more serious.

Symptoms.—Shock is usually severe. In complicated fractures, involving the cord, all the muscles below the seat of fracture are paralysed (p. 361), and there is local irregularity and tenderness over the seat of fracture.

First aid.—Place a rug under the patient and turn him on to his face, lift him on the rug on to a stretcher keeping him in the ventral (prone) position (Plate XXVII).

After-treatment.—Simple fractures of the dorsal or lumbar vertebrae are treated by hyperextending the spine, which reduces the deformity. A plaster jacket is then applied, a full description will be found on p. 176. The patient is allowed up in a few days.

Complicated fractures involving the cord.—If the patient's condition is good, reduction of the fracture is performed, followed by immobilization in a plaster jacket until the fracture has consolidated (see p. 528). In more complicated cases where the above treatment is not possible, the main dangers are sepsis from pressure sores on back and heels, and cystitis (p. 245) from an infected bladder, and unless prevented, frequently cause the death of the patient. To prevent this sepsis Böhler's method is as follows. Pins are inserted into the upper end of each tibia for 3 or 4 weeks and then the lower end of each femur for a similar period. Traction with about 12 lb. weight is made, thus relieving the body weight from the sacrum. The feet are suspended by adhesive strapping attached to the soles of the feet, to prevent pressure on the heels.

An enema, or aperient, is given every other day. To prevent cystitis, a supra-pubic cystotomy (p. 492) is performed, followed by daily bladder lavage (p. 70). Pressure points are cared for in the usual way. Later, when the patient's condition has improved, a plaster jacket is applied and active movements started.

Nursing.—When changing the sheets, two nurses should gently roll the patient ***en bloc***, whilst a third attends to the sheet (see bedmaking, p. 92). Every care must be taken in the prevention of bedsores (p. 363), and also in maintaining the limbs and apparatus in good position. A cradle is used to prevent pressure on the feet. (For nursing of surgical diseases of the spine see p. 491.)

Complications which may arise are: Hypostatic pneumonia (p. 257), bronchitis (p. 248), cystitis (p. 245), bedsores (p. 17) deformities of the paralysed limbs (p. 613).

Separation of an Epiphysis.—*Epiphysis* is the name given to the growing ends of long bones. Separation occurs in children as a result of violence directed towards the end of the bone. It may also occur in the following diseases: inherited syphilis (p. 605), rickets (p. 601), scurvy (p. 602), suppurative osteomyelitis (p. 572), or tuberculous epiphysitis. The femur and the radius are the bones most commonly affected.

Symptoms.—There is often very little displacement owing to the periosteum retaining its connection with the epiphyseal cartilage. Union occurs by the formation of callus, but the growth of the bone may be hindered unless the parts are very carefully adjusted. Suppuration (p. 568) may occur in unhealthy children when the accident is compound. The detachment may be partial, giving the appearance of a sprain (see below).

Treatment.—After reduction (p. 530) the limb is put up in plaster of paris, or operative treatment may be undertaken.

INJURIES TO JOINTS

Strains.—A strain occurs from a muscle or tendon becoming over-stretched, and is generally due to lifting some heavy weight.

The ***treatment*** consists in keeping the part at rest and applying hot fomentations (p. 90). Massage and passive movement (p. 750) may be given from the first.

Sprains.—Sprains result from a severe twist or wrench which unduly stretches, and sometimes tears, the ligaments of a joint.

Symptoms.—The symptoms are: Acute pain; swelling; some deformity; effusion of blood and discoloration; loss of power in the joint.

First aid.—Apply a tight bandage and keep the part raised.

After-treatment.—A firm bandage is applied and the joint kept wet with cooling or evaporating lotions (p. 93), or hot fomentations (p. 90) may be applied. In severe cases the limb is put on a splint and kept at rest until the ligaments have healed. Massage (p. 750) is ordered after the first week or 10 days, then gentle passive movements until active movements are allowed.

Dislocations.—Dislocation occurs when the bones forming a joint are displaced. A dislocation may be simple or compound.

Symptoms.—The symptoms are: Pain at the joint; deformity; swelling; fixity of the joint; abnormal position of the limb; shock.

First aid.—Make the patient as comfortable as possible by easing the clothing and supporting the limb in whatever position is the least painful. Do not attempt to reduce the dislocation.

After-treatment.—Shock is treated (p. 561). An anaesthetic is administered if necessary (p. 446), and the surgeon reduces the dislocation by manipulation. If it cannot be so reduced, extension (p. 149) is employed for a time, then manipulative movements are again employed. After reduction, the limb is kept absolutely at rest to allow of healing of the torn capsule. Massage may be ordered after six or seven days (p. 730), and later passive movements are given until active movements are allowed. Any joint may become dislocated, but some are more liable than others. A compound dislocation is treated as a wound (p. 517) in addition to the above treatment. (For operations on joints see p. 473.)

Bruised Bone.—Bruising of the bone may occur without a fracture, blood being extravasated into the periosteum, resulting in swelling, pain, and tension. Even though slight it may be complicated by sepsis, beginning with slight periostitis and progressing in a few hours to osteomyelitis (p. 572), the patient becoming urgently ill, with high temperature and great prostration. Immediate operation is undertaken to open and drain the medullary cavity.

A bruise of the bone may also cause a swelling due to extravasated blood, the exudation may be absorbed and form a fibrous lump persisting for some time. A sub-periosteal haematoma (p. 563) may form.

Heat is usually applied to the part to aid absorption.

Loss of Consciousness

Loss of consciousness may be due to any of the following causes: (1) Injury to the brain, i.e. concussion, compression, haemorrhage. (2) Shock, fainting, fits, coma, hypoglycaemia. (3) Suffocation, strangulation, drowning. (4) Poisoning. (5) Sunstroke, electric shock, cold stroke.

General Treatment for Unconsciousness.—In all cases of unconsciousness the best and safest position for the patient is the prone position (Plate XXVII). If this is impossible, the patient should be treated as follows: Lay the patient flat on his back with the head slightly turned to one side. If the face is pale, keep the head level with the body; if flushed, raise it a little above the level of the body. Loosen all clothing around the throat, chest, and waist. Provide for a sufficiency of fresh air. See that the mouth is empty, remove any false teeth if present. On no account give any fluid by mouth, either water, stimulant, or medicine. Examine the patient as follows:

(1) *The circulation.*—Feel the pulse at the wrist (p. 200); if it is not perceptible, place the finger on the carotid artery, or the hand over the heart; notice the colour of the face and extremities.

(2) *Respiration.*—Notice if there is movement of the chest and abdomen; if none is seen, place the hand on the chest, note the rate of respiration, if present.

(3) *Examine the scalp* for wounds, bruises, or swelling; examine the ears, note if there is any discharge of blood or clear fluid; examine the limbs for fractures, dislocations, wounds, or paralysis; examine the trunk for injuries, bruises, wounds, and fractures.

(4) *Note* the condition of the pupils, whether dilated, contracted, unequal, whether they react to light (p. 209). Note if there is haemorrhage from the mouth or nose. If a bleeding wound be found, the haemorrhage must at once be stopped (p. 564); if a fracture, splints must be applied and the limb secured. The patient is then carried on a stretcher, if in the open, to the house and put to bed, and after undressing, made warm with hot blankets and hot-water bottles. If no wound or injury be found, other symptoms must be looked for, and the proper treatment for the cause of the unconsciousness adopted. In all cases of unconsciousness it is far better to do too little than too much. The patient needs to be kept absolutely quiet until the arrival of the doctor, no attempts should be made to rouse him.

1. Injury to the Brain.—**(*a*) Concussion.**—Concussion is a sudden interruption of the functions of the brain.

Cause.—A fall or a blow.

Symptoms.—The patient falls down, and becomes very pale; the breathing is slow and shallow; the surface of the body is cold. If the concussion is slight, the patient may be made to understand a question, he will take some time to answer, and then relapse into a semi-unconscious state.

First aid.—Treatment as described above.

After-treatment.—The patient is kept absolutely quiet in the recumbent position. Shock is treated (p. 561). The bowels are kept freely open. Food is administered either by rectal (p. 58) or nasal feeding (p. 55) until the patient is conscious. The amount of urine passed should be measured and a daily specimen tested. If necessary, the bladder should be emptied by catheter (p. 66). As the patient recovers he will become restless and irritable, vomiting may be present. The patient is kept in bed for at least three weeks, or until the function of the brain has been restored, and all signs of irritability and drowsiness have passed.

(*b*) **Compression.**—Compression is due to a piece of bone, any foreign material, or blood-clot pressing on the brain. It is a much more serious condition than that of concussion, but concussion may be present with compression.

Symptoms.—The symptoms may include unconsciousness; dilated or unequal pupils, squint (see conjugate deviation, p. 209); very slow pulse, subnormal temperature; deep, slow, snoring respiration (p. 205); vomiting; discharge from one or both ears; paralysis (p. 361) of one side of the body or affecting one limb. The symptoms vary considerably according to the part of the brain that is compressed; other symptoms than these may be present, or some of the symptoms mentioned may be absent.

First aid is that already given under general treatment (p. 545).

After-treatment.—When the patient's condition allows of it, an operation is undertaken to remove the cause of the compression (decompression, p. 477). Absolute quiet is necessary, the light in the room should be subdued and the bed placed with the head back to the light. The temperature, pulse, and respiration are taken every 4 hours or oftener. Pyrexia is commonly present, and is treated by cold sponging, or cold packs (p. 110). An ice-bag may be ordered for the head. The bowels are kept freely open, croton oil in glycerine or butter may be prescribed to be placed on the patient's tongue if he is unable to swallow, later calomel may be ordered. The urine should be measured and a daily specimen tested. Retention of urine (p. 238) if present is relieved by catheter. *Diet.*—Food is administered by rectal or nasal feeding (p. 55) until the patient is conscious. The diet must be of a light and unstimulating nature until convalescence is assured. The wound may require daily dressing, or less often, according to the amount of cerebro-spinal fluid escaping. The usual dressings are required (p. 40) and a triangular bandage. For bedmaking the patient should be gently turned from side to side. Precautions must be taken to guard against bedsores (p. 363), as these patients are particularly susceptible. The patient is not allowed to read, write, or see any visitors until the surgeon gives permission. (For further nursing see p. 477.) Massage

(p. 750) may be ordered later to the limbs that have been affected. The time the patient is confined to bed varies, but he is not allowed up until all active trouble in the brain has ceased.

Complications.—These include shock (p. 561), haemorrhage (p. 563), septic meningitis (p. 375), paralysis of vital parts, pneumonia (p. 251), delirium (p. 359).

(*c*) **Haemorrhage.**—See intracerebral haemorrhage, p. 377.

2. **Shock.**—See shock, p. 561.

Fainting.—*Cause.*—Fainting is due to the heart not acting with sufficient power to supply the brain with a proper quantity of blood, and may be caused by the heat of a crowded room, fright, haemorrhage from a wound, excessive hunger or fatigue, or anaemia.

Symptoms.—The symptoms are: Restlessness, pallor, perspiration round the mouth and on the forehead, staggering, and finally falling and loss of consciousness.

First aid.—If the patient is in a crowded room, place him on a chair, and press his head between his knees till the face becomes red; loosen the clothing around his neck, then lead him out into the open air, lay him flat on his back, and loosen the clothing round the waist. When conscious a small quantity of stimulant or cold water may be given, smelling salts may be used until he is conscious. If the room is not too crowded, he can at once be laid flat on his back, and the clothing loosened. All bystanders must be made to keep away from him so that he gets plenty of air. If the fainting is due to hunger or fatigue, sweetened warm drinks, such as tea, milk, coffee, bovril, or soup, should be given at frequent intervals, as a large quantity of food given at once may cause vomiting. (For the treatment of fainting due to loss of blood see haemorrhage, p. 565; in heart disease, p. 276.)

After-treatment.—Rest, good food, and fresh air are essential.

Fits.—Fits may be due to any of the following diseases, the after-treatment for which will be found under their respective headings: Epilepsy (p. 385), Petit Mal (p. 386), Hysteria (p. 392), Uraemia (p. 238), Eclampsia (p. 702), Brain Disorders (p. 374).

First aid.—Lay the patient flat on the ground, loosen the clothing, place something between the teeth to prevent the tongue being bitten, a pencil, cork, or large piece of india-rubber wrapped up in a handkerchief. Prevent the patient injuring himself by removing anything within reach on which he might knock himself, use gentle restraint if necessary. Allow him to remain where he is until the fit is over; when conscious, assist him on to a sofa or bed and allow him to sleep. (Points to be noted during a fit, see p. 387.)

3. **Suffocation.** — **Asphyxia.** — *Causes.* — Common causes are:

Escape of ordinary gas, smoke from a burning house, fumes from a well or sewer containing carbonic acid gas, or carbon monoxide (mines) or motor car exhaust.

Symptoms.—The symptoms are: Unconsciousness (p. 544), very feeble respiration, or none.

First aid.—Remove the patient as quickly as possible from the place of accident into the fresh air, loosen all clothing, slap the face and chest with a towel dipped in cold water, to try to make him gasp, and so fill the chest with air. If this does not rouse him and respiration is very feeble, artificial respiration (p. 549) must be started and continued until the breathing becomes natural. If the patient is lying insensible in a room full of gas or smoke, the rescuer must tie a wet cloth or handkerchief over his nose and mouth, and crawl into the room to the patient and drag him out. The door should be left wide open, and the window opened or broken at once (this must not be done if the room is on fire, as it would cause the fire to spread by letting in fresh air).

Strangulation.—*Symptoms.*—The symptoms are: Unconsciousness, discoloration of the head and face.

First aid.—If strangulated by hanging, cut the patient down at once, being careful to catch him, to prevent his falling and injuring himself; then take the rope off his neck, loosen the clothing, and use artificial respiration (p. 549) immediately. If due to some constriction round the neck, cut this and use artificial respiration at once.

After-treatment consists in rest, fresh air, warmth, and good food.

Drowning.—*Symptoms.*—The symptoms are unconsciousness with possibly cessation of respiration, and imperceptible pulse and heart-beats.

First aid.—Loosen all clothing around the chest and throat, clear the mouth of any weed or foreign matter in it; then roll the patient on to his chest (see Plate XXVIII, Schäfer's method) and draw the tongue forward and keep it in position by tying a piece of cord, handkerchief, or elastic round the tongue and securing the ends firmly beneath the chin; then use artificial respiration (p. 549). Although all signs of respiration have ceased, the pulse and the action of the heart cannot be made out, the pupils are widely dilated and do not respond to light, resuscitation should be started and persevered with until the temperature of the body falls far below normal, or the doctor pronounces it useless.

After-treatment.—Whilst artificial respiration is being performed, a second person should remove the boots, socks, and such clothing as can be taken off without interfering with artificial respiration. The patient should then be covered with hot blankets and have hot bottles placed around. The extremities may be rubbed towards the heart with spirit. Stimulants may be ordered either hypodermically or by rectum. When respiration is established, the patient is removed to bed. Any remaining wet clothes are taken off and warmth applied by means of friction with hot dry towels followed by hot blankets and carefully placed hot bottles. Shock is treated (p. 561). A hot stimulating drink should be given as soon as consciousness returns. The patient will require to be kept in bed and very warm for several days.

Complications such as pleurisy (p. 262), pneumonia (p. 251), and heart trouble may become manifest during the ensuing week. (See symptoms of heart disease, p. 265.)

Artificial Respiration.—Sylvester's Method.—Place a hard cushion or rolled-up coat or rug under the patient's shoulders, allowing the head to fall back. Kneel at the patient's head, with one knee on either side of it; bend the patient's forearms upon his arms, and grasp them firmly just above the elbow (Plate XXIXA); then draw the arms upwards with a sweeping movement outwards as far as they will come. Hold them in this position whilst counting two (Plate XXIXB), then carry them down to the side again, and press them firmly against it whilst counting two once more. Continue these movements regularly, about fifteen times a minute, until the patient begins to breathe.

Schäfer's Method.—Lay the patient face downwards on the ground; turn the head to one side; place the arms in an extended position on either side of the head, palms downwards; kneel astride the patient; place a hand on either side of the patient's back, the thumbs directed inwards, and close to the spine, the fingers well spread out so as to grasp the lower ribs; lean forward keeping the arms stiff, and press upon the body steadily and firmly. Without removing the hands, relax the pressure on the ribs, and bend back towards the heels. These movements must be repeated fifteen times a minute until breathing is established; after continuing these movements about 12–15 times, drawing up the arm as shown in second position (Plate XXVIII) increases the distance between the ribs and further expands the chest (this is done first to one side and then the other).

The Drinker Respirator (Iron Lung) is a device for the prolonged administration of artificial respiration, and was designed by Dr Phillip Drinker, of Harvard University.

The manual methods of artificial respiration are not well adapted for prolonged use, and it is almost impossible by their means to produce and maintain adequate oxygen interchange in cases requiring long-time administration.

The failure of the present methods and appliances has led to the demand for a mechanical device which will be capable of working steadily over a long period of time, will permit control of the rate and depth of respiration, and will be capable of producing adequate artificial respiration without discomfort or harm to the patient.

These requirements are satisfied by the Drinker respirator, see Plate XXX.

The apparatus consists of an enamelled steel chamber, which is large enough to accommodate a man 6 feet 4 inches in height, and can also be used for a small child. The patient lies on a sectional sponge mattress placed on a truck, which is attached to the lid of the chamber. The head and neck of the patient extend beyond the lid through a rubber collar, the head resting on a pad attached to the lid. The lid and truck of the chamber can be pulled in and out with ease to permit occasional examination of the patient, and these motions can be accomplished very rapidly.

By means of an electrically-driven bellows, the pressure inside the chamber is alternately reduced and restored to normal. Both speed and depth of respiration can be varied. In the event of failure of the electricity supply, means are provided for operating the machine by hand.

The head rest and the upper part of the bed are adjustable for height. Tubular extensions are provided, if required, to accommodate cases in which splinting of the arms is necessary. The apparatus can also be made to tilt in either direction.

Conscious patients can eat, drink, and sleep in the respirator without stopping the mechanism.

In emergencies, and without pulling out the bed, enemata and rectal saline infusion are administered through the hand-holes provided in the side of the machine, and a rectal tube can be inserted by the nurse passing her hand through one of the port-holes.

The respirator has been used successfully in cases of respiratory failure resulting from poliomyelitis (p. 346), severe carbon monoxide poisoning (p. 548), morphine, and other drug poisons, alcoholic coma, hiccoughs, drowning (p. 548) and, in the small size specially made for babies, numerous cases of asphyxia in the newborn (p. 714).

Note.—When ordering it is necessary to specify the voltage and characteristics of the electricity supply.

4. **Poisoning.**—For treatment for poisoning by drugs see poisons and antidotes (p. 777).

Alcohol Poisoning.—*Symptoms.*—The symptoms are unconsciousness, both sides of the body being equally helpless, pale face, breathing slow and heavy, pupils dilated and equal, surface of the body cold; if able to be roused, incoherent answers will be given.

First aid.—That given under general treatment (p. 545).

After-treatment.—When it is quite certain that the patient is suffering from too much alcohol, the stomach is emptied and washed out (p. 64) and 4-6 ounces of mist. alba are given before withdrawing the tube. When conscious, the patient is given a drink of hot, strong coffee. Patients suffering from alcoholic poisoning are very susceptible to cold, so need to be kept warm with hot blankets and hot bottles. Too great reliance must not be placed on the odour of the patient's breath, as he may have had a fit or accident after taking a very small quantity of alcohol. No one but a medical man should take upon himself to pronounce the patient to be suffering only from drunkenness, as serious and fatal mistakes have been made by so doing.

Ptomaine Poisoning.—Foods may become poisonous from the development within them of certain ferments which act as poisons. Tinned meats, stale fish, meat, and meat pies are often affected.

Symptoms. — The symptoms are: Abdominal pain, vomiting, purging, weakness, cramp, dilated pupils, drowsiness, collapse.

Treatment.—Medical advice should be sought at once. Castor oil is usually prescribed in order to get rid of the poison. Stimulants such as hot coffee, tea, or brandy are given. The patient is put to bed with warm blankets and hot bottles. Fomentations (p. 90) may be applied to the abdomen. Collapse is treated (p. 562). Light milky diet is given when vomiting ceases. The patient remains in bed until all symptoms disappear and the strength has been restored.

5. **Sunstroke.**—*Cause.*—Over-fatigue in hot weather, or undergoing great exertion when exposed to a high temperature.

Symptoms.—Throbbing and fullness in the head, with a feeling of sickness or faintness, cold clammy skin, rapid feeble pulse, weakness, staggering, and finally collapse are the chief symptoms.

First aid.—Remove the patient at once into the shade, or away from the heat. Loosen all clothing around the chest and throat; bathe the head freely with cold water, which should be allowed to run in a gentle stream either from a can or jug.

After-treatment.—Put the patient to bed and cover him with one blanket. Raise the head. Send for the doctor. Ice may be applied to the head, and when conscious the patient may be given ice to suck. Do not give stimulants. Rectal saline may be ordered if there is prolonged shock. Pyrexia (p. 199) if present is treated by cold packs, ice cradles, or cold sponging (p. 111), according to instructions. Quiet and absolute rest are necessary until all the symptoms have passed. The patient should avoid exposure to the sun and heat for a long time subsequently.

Electric Shock or Stroke.—*Cause.*—Contact with live electric wires, or cable.

Symptoms.—The symptoms are: Feeling of heat, profuse perspiration, flushed face, then insensibility, and pallor.

First aid.—The effect of coming in contact with an electric cable, wire, or rail is at once to deprive the individual of the power of motion, so that the hand, or whatever part of the body is in contact, cannot be removed, and unless speedily rescued death may result.

To rescue a person who is in contact with the current.—The difficulty in this lies in the fact that unless the rescuer is insulated, the current will pass through him, causing the same condition. To insulate the body, cover the hands with a non-conducting substance, and stand upon a non-conducting material. Stand on a piece of dry wood, glass, or straw; if dry rubber tennis shoes or galoshes are worn, this will suffice. Cover the hands with rubber gloves if available, or a rubber tobacco pouch may be made to answer the purpose, then grasp the patient's clothing and pull him away; if nothing else is at hand, wrap the hand in a dry cloth and seize a dry piece of wood, broom, walking-stick, etc., and push the patient away. When the patient has been removed from the contact, apply artificial respiration (p. 549) if breathing has ceased.

After-treatment.—Place the patient in bed with the head low. Send for the doctor and apply warmth and the usual treatment for shock (p. 561).

Cold Stroke.—May occur as a result from prolonged exposure to cold, and is more marked if starvation is also present.

Symptoms.—The patient is unconscious or partly conscious, the surface of the body is cold and dry, the extremities are blue, also the lips, nose, and ears. The temperature is below 96° F., the pulse is extremely feeble or may be imperceptible, respiration is slow and shallow.

Treatment.—Place the patient in bed, send for the doctor. Remove the patient's clothing and rub briskly all over with hot dry towels, then cover with hot blankets and place hot bottles in the bed. A drink of hot brandy may be given if the patient is conscious. Hot fomentations are applied to the abdomen and changed frequently. If available, an electric thermal pad applied to the abdomen, or radiant-heat cradle (p. 112), will greatly expedite recovery. Treatment ordered is that described under collapse (p. 562). When conscious hot liquid diet is given; in cases in which starvation is present a quantity of one ounce is given to start with and gradually increased until solid diet is given.

The *complications* are: Heart failure, collapse.

CHEMICAL WARFARE

Chemical warfare materials may be divided under two heads: (1) Non-persistent; (2) Persistent. There are some midway between the two: semi-persistent.

(1) Non-persistent dissipate very quickly. It is a matter of a few minutes and depends on the ground and weather.

(2) Persistent materials may remain active for days or even weeks. These chemical materials are divided into four groups according to their effect on the body:

1. Tear gases or lachrymators. 2. Sneezing gases or sternutators. 3. Lung irritants or pulmonary gases. 4. Blistering gases or vesicant agents.

The word 'gas' is a misnomer. Many are not gases at all at ordinary temperatures. Those in group 2 are finely divided solids; in group 4, liquids in very minute droplets. All group 4 are fully persistent. All group 2 are semi-persistent, the effect lasting a few hours. Groups 1 and 3 are mixed, non-persistent and semi-persistent. All substances approved for chemical warfare fall into these groups which are based on effect on body, not on chemistry.

1. **Tear Gases.**—Tear gases act on the eye. They are used at the best strength to produce eye symptoms: they could be used to produce lung symptoms at a higher concentration, but this is wasteful of material. Occasionally individuals show lung symptoms due to a special idiosyncrasy. These materials act at a very low concentration: 1 part in 5,000,000.

Treatment.—The eyes are washed out with saline, or the face may be plunged in a basin of clean cold water, opening the eyes under water. A few drops of chloroform on gauze or linen lessen the severity of the symptoms, but as many are affected, it is doubtful if this could be done in war conditions.

2. **Sneezing Gases** act on the sensory nerves of the nose, head, throat, and neck, and may produce lung symptoms. Sensory gases act quickly in a few minutes, but not so quickly as tear gases. They produce an extreme degree of discomfort, amounting in some people to pain. The discomfort is felt all over the head, frontal sinus, ethmoidal sinus, antra, teeth, gums, and throat, and also in the upper part of the chest, and consists of a burning, irritating sensation with a tendency to coryza (p. 659). Definite nausea, or in some cases vomiting, accompanies the condition.

There is marked mental depression, which has no relation to the extent of the damage. In rare cases there may be dermatitis, arsenic poisoning, or damage to the lung.

These materials, being solid, are most difficult to keep out of respirators. If there is a weak spot in a respirator they get through.

Treatment.—A few drops of chloroform on linen or handkerchief to be sniffed up the air-passages lessen the severity of the symptoms, but as many persons are affected, it is doubtful if this could be done in war conditions. It is important, from the point of view of panic, to convince the patients that they are not seriously damaged. They should be fit for duty in twenty-four hours.

3. **Lung Irritants or pulmonary gases** are the most serious from the point of view of life and produce most serious casualties and the highest death rate. First aid and treatment rest on a physiological basis. The materials act on the lung tissue and have only a relatively unimportant effect on the bronchi, trachea, and throat.

The breathing apparatus consists of the air passages and the air cells or alveoli. Breathing only as far as the alveolus is not really breathing at all, merely a pumping action to draw air in and out. True respiration occurs in the alveoli and it is these that are affected. The bronchiole ends in an alveolar sac lined with mucous membrane: around the mucous membrane are the blood-vessels of the pulmonary circulation. In the alveolus oxygen passes from the air into the blood, and carbon-dioxide is diffused from the blood into the air through the mucous membrane so that the body takes in oxygen and gets rid of carbon-dioxide. If carbon-dioxide is in excess in the blood, it stimulates the respiratory centre (p. 456) causing panting, bluish tinge in the blood, and increased force and rise of the heart-beat. If the oxygen supply is diminished, it causes the opposite results; there is a tendency to collapse, the patient is pale, breathing is depressed and the heart action is rapid and feeble.

When the lungs are affected by gases, three things happen:

(1) The mucous membrane swells.

(2) Fluid is poured out by the mucous membrane—a protective mechanism to wash away the irritant.

(3) Fluid is poured out of the blood-vessels and collects between the blood-vessels and the mucous membrane, causing oedema of the lung.

These all help to form a barrier between the blood and the air which interferes with the outflow of carbon-dioxide and the intake of oxygen.

One of the most serious things that can happen to the body is the cutting off of the oxygen supply. The body cells depend on a regular supply of oxygen for life and at once begin to die if it is cut off. These cases suffer from lack of oxygen, which may prove fatal. Also carbon-dioxide is dammed up in the body by the barrier. Both these factors will be present and one or other will predominate: which factor is the greater in any case will depend on the concentration of the gas, exposure, and first aid treatment. The lack of oxygen is the more important.

Treatment of Cases of Lung Irritation by Gas Poisoning.—*First aid.*—The main plank of the first-aid treatment is REST. This is of the utmost importance. On the degree of rest provided may depend the patient's chance of life, and in slight cases, the chance that the condition will not become serious. Rest is important because any form of exercise calls for increased consumption of oxygen. In treating these patients the object is to keep the consumption of oxygen as low as possible. On no account should artificial respiration be resorted to.

Complete rest includes: (*a*) mental rest; (*b*) physiological rest; (*c*) physical rest.

(*a*) *Mental rest.*—This group has a mental state associated with it. There is a sense of impending disaster: this has no relation to the severity of the physical condition. Whilst this is present the patient cannot be truly at rest. It must be combated.

(*b*) *Physiological rest.*—This implies warmth in the first place. Secondly nourishment, though possibly the patient may be too ill to feel hungry. The nourishment must be warm, fluid, easily digested, and non-stimulating. Stimulation is in direct contravention to rest.

(*c*) *Physical rest.*—There must be absolute physical rest from the start if possible. This means in military language, the patient is a 'stretcher case.' This may not always be practicable, but it is the ideal.

Treatment.—There are three main lines of treatment: (1) administration of oxygen; (2) venesection; (3) intravenous infusion.

(1) (i) Oxygen administration may be carried out by funnel and tube (p. 108). This may be the only means available, and therefore the one which would have to be used.

(ii) By nasal catheters (p. 107).

(iii) By B.L.B. mask (p. 107).

The cases will divide themselves fairly definitely into two classes: (1) purple or blue; (2) grey.

In each case it is a question as to which part of the process of respiration is most upset. If the patient has great difficulty in getting rid of carbon-dioxide, he will come under the purple class. He will be restless, excited, with panting respiration, full bounding pulse, and with all the appearance of being dramatically ill. If the patient is suffering from lack of oxygen, he belongs to the 'grey' class. He will be collapsed, comatose, with shallow sighing respiration, rapid feeble pulse. Cases divide themselves fairly definitely into one of these two groups, though there are a few border-line cases. They must be carefully distinguished, and it must be remembered that the dramatic ' purple ' case is less seriously ill than the ' grey ' case, for it is much worse to be short of oxygen than to have excess carbon-dioxide. Both cases need oxygen to restore the balance, for in both cases there is lack of oxygen: both remain in their own class and do not under treatment pass from one type to the other.

Oxygen is administered for 25 minutes, discontinued for 5 minutes, and this is repeated until the patient shows improvement: as a rule the patient shows improvement or dies within 48 hours. The nurse administering the oxygen must keep an accurate record of the times of giving oxygen and a report on the patient's colour, pulse, and general condition every half-hour. The patients will probably be troubled by vomiting and by coughing up fluid from the oedema of the lung. They will be restless, and though they are not delirious, the restlessness may make them appear so. The patients have to be fed and generally nursed, and it may be a very difficult task, but as far as is possible the nursing aims at not interfering with the oxygen administration.

(2) *Venesection* (p. 82) is advised in ' blue ' cases where the heart is being overworked, up to half a pint of blood being removed.

(3) *Intravenous infusion* is adopted where it is suspected that oedema is so intense that the blood has become concentrated and thick, as in cholera. In such cases the blood is not concerned with itself primarily but with the body cells and has drained itself to give them fluid, as in advanced cholera, so that the blood is ' tarry,' which causes the heart very hard work in forcing this sticky fluid round the body. Thus intravenous infusion of either blood plasma, normal saline, or gum acacia solution is very helpful (for method see p. 80).

So there are three forms of treatment: oxygen always; sometimes venesection; sometimes intravenous infusion. The rest of the treatment and nursing is not specific and is just as for serious lung diseases, see p. 247.

4. **Blistering Gases.**—These so-called gases are not gases, but liquids which steadily and slowly give off poison vapour, causing chemical burns culminating in blistering and ulcers in any portion of the living body, inside or out, with which they come into contact.

This vapour is very poisonous and very persistent, remaining active for days and even weeks: it penetrates most materials, metal, glass, and good tiles being exceptions. A material for making overalls to protect the body has been made which keeps it out for 4 hours, otherwise it soaks into all clothes and tissues with which it comes into contact. It is very difficult to detect its presence;

it can be seen when in large enough quantities to make an oily stain. It is said to smell like mustard, that is, it causes a tingling sensation in the nose. Four to twelve hours or longer may elapse before lesions begin to develop. Blistering gases produce either (*a*) erythema (p. 188); (*b*) blisters (p. 189); or (*c*) ulcers (p. 573).

Decontamination.—First aid is not exactly first aid, as no immediate effect appears. There is an interval of time before the lesion develops. In place of first aid there is to be carried out at this time—decontamination. This aims at preventing development of the lesion in case the gas may have gained access to the body. The patient is a *suspected* case. It is not known if the liquid has reached the patient because of its delayed action. There is therefore a time factor before penetration has carried it beyond reach —about 20 minutes in which to try and stop the lesion developing. The best and most practical method is by removal of the gas from the skin mechanically, i.e. washing with soap, water, and nail brush. This is simple, universally obtainable, and can be used by the individual. A complete wash with soap and water is therefore the best prevention. The eyes being the most vulnerable of all parts of the body, require immediate irrigation with bicarbonate of soda—2 drams to 1 pint water. The patient should also gargle his throat with the same solution, and sniff the fluid up his nose, the external parts being washed with soap and water. The patient on arrival is treated as an infectious case, as neither he nor any one knows whether he has been contaminated by mustard gas or where. The patient is stripped by a person dressed in specially prepared material (p. 560), the clothes when removed being put in the open air. After removal of the clothes, he is wrapped in a sheet. His eyes are then bathed, and he is then sent to bath with instructions to wash and scrub thoroughly, so as to remove any contamination. A shower bath is best, but an ordinary bath will do. After the bath he is given a towel, not before, or he will infect it. He is then given clean clothing and treated as a suspect. Any spots or splashes of liquid gas on the skin should be removed with cotton wool dabs, and anti-gas ointment applied by rubbing in for fully 2 minutes. The ointment is then wiped off with cotton wool, and triple dye jelly is liberally applied. Should no anti-gas ointment be available the affected part should be washed with soap and water, and triple dye jelly applied.

Treatment of lesions.—(1) *Erythema.*—The most vulnerable parts of the body are the eyes and where the skin is moist, i.e. the armpits, groins, scrotum. It is very difficult to allay irritation, but the following may be tried: evaporating lotion, dusting powder, permanganate solution, oxydizing solutions of all kinds.

(2) *Blisters.*—The fluid from the blister must not be allowed to run out on the adjacent skin, though it does no harm if placed on the skin of another person. The serous fluid from the blister which is unable to affect normal skin may damage the unhealthy area, the reason being that the liquid penetrates laterally, so that the skin surrounding the blister is resting on a damaged substratum.

Amyl salicylate is applied on lint over the whole burnt area, and requires daily dressing. Amyl salicylate should not be used on the face, as its vapour irritates the eyes, nor should it be used when there is an open wound near the burn. When amyl salicylate cannot be obtained or is unsuitable, gentian violet jelly is used (see p. 99).

(3) An *ulcer* is a chemical burn of the first degree. There is less shock, but more tenderness than a thermal burn, as it is on a deep-seated damaged area. The burn is characterized by massive peripheral oedema with central necrosis.

Ulcers may be treated as blisters.

Should an arm or leg be burned the limb may be enclosed in a Stannard irrigation envelope (described on p. 101), and douched with Milton solution 2 or 3 times daily.

These lesions take a long time to heal, and very often become septic, but as the damaged area has a depleted blood supply the poison does not get rapidly into the system; there is therefore very little toxaemia.

Oils and ointments should not be put near the wound, as these agents shut in the toxins from the damaged tissue, and septic absorption results.

If the eyes are affected the sight may be permanently damaged by the burning of the cornea. Photophobia and pain are present. Frequent lavage, atropine, yellow oxide of mercury ointment, and protection from light are essential. Further treatment is that given under burns of the eye (p. 641).

The majority of mustard gas burn cases recover, although slowly. The greatest difficulty is to combat mental apathy; the patient gets so tired and morbid, he does not want to get well.

Internal.—If the vapour has been inhaled, the patient may have a hard metallic cough, due to burning of the larynx. He may acquire a serious, even fatal lung condition if the gas gets into the lung in sufficient strength; then there is nothing effective in the way of treatment. If the vapour is swallowed, inflammation of the lining of the stomach ensues, causing acute gastritis.

Lewisite Gas Arsenic (arseniuretted hydrogen).—Burns from this gas are much more fatal than those produced by mustard gas.

Lewisite is a colourless oily fluid, somewhat resembling glycerine in appearance, and smells of geraniums. Its action on the skin is immediate, and a definite sting is felt. It is absorbed much more readily than mustard gas, and is far more toxic. It contains arsenic, and causes a blister to form, from which arsenic is absorbed. Treatment is urgent to save life.

Treatment.—The area of the burn or blister is swabbed with hydrogen peroxide (H_2O_2). If a blister is present the covering skin of the blister should be removed with sterile scissors, and the whole area dabbed with hydrogen peroxide. Lint soaked in the solution is then applied to cover the whole area, and frequently renewed. In the tropics a solid preparation or Hyperol can be used.

The possibilities of arsenic poisoning have to be borne in mind; for symptoms and treatment see p. 772.

Phosphorus Burns are caused by phosphorus-containing bombs, grenades, or bullets.

Treatment.—The burnt area should be washed, or, if possible, treated with 2 per cent sodium bicarbonate, followed by the application of 2 per cent solution of copper sulphate. Copper sulphate produces an inert chemical compound, and so prevents further action. If no copper sulphate is available a water compress should be applied, and changed every 10 minutes.

It is important not to use oily dressings, as phosphorus is readily soluble in oil. Phosphorus poisoning, see p. 775.

List of Gases

Group I. Tear gases or lachrymators.

Ethyl iodo-acetate. Smells of pear drops.
Chloracetophenone. Smells of Ronuk.

Group II. Sneezing gases or sternutators.

Di-phenol-chlorarsine. Sensory irritant.

Group III. Lung irritants or choking gases.

Chlorine. This is now out of date as it is too obvious, i.e. smell.
Phosgene. Smelling of rotten tobacco, much used in commerce. Very insidious.
Chloropicrin. More persistent than the other two, but evaporates very quickly.

Group IV. Blistering agents or vesicant gases.

Mustard gas. This is the greatest casualty producer, and is the one certain to be used again if chemical warfare is employed. Smells of garlic, onions, etc.
Lewisite (named after an American professor, Lewis), is

distinguished by a strong smell of geraniums, and tingles and irritates the skin. The lesions are more easily prevented and treated. It is an arsenic compound with possibilities of arsenic poisoning (p. 772).

Protection.—For those engaged in A.R.P. work a metal helmet and anti-gas mask (Plate XXXI) are provided. In addition a complete covering for the body made from Wigan cloth with gum boots is provided for those employed in decontamination work.

Civilians not thus engaged are provided with an anti-gas mask and are advised to take cover as soon as an air raid warning is sounded or the sound of gun fire is heard.

Suitable cover consists in either public air raid shelters, a properly dug trench in the garden, a cellar with a suitable exit, or a ground-floor room with Morrison table shelter, the window of which has been protected so that there may be no danger from flying glass or bomb splinters. First-aid dressings (see p. 519) should be kept in the selected refuge room in case of injury, also some restorative such as sal volatile, water, smelling salts, etc.

Experience in war areas has shown that casualties for the civil population fall to a very small number when people take cover and avoid exposure to bomb and anti-aircraft splinters, machine gun bullets, and flying glass.

If caught in the open with no available shelter go into a ditch or behind a low wall or mound if possible, lie down on your face and put your fingers in your ears. It is a good plan to have a rolled up handkerchief or piece of cork to bite on as this prevents shock to the brain.

CHAPTER XVII

THE COMPLICATIONS OF WOUNDS

THE chief complications occurring in connection with wounds comprise: (1) Shock; (2) Haemorrhage; (3) those due to Infection.

SHOCK

Shock is a sudden prostration due to painful impressions. It is a frequent cause of death after operations, accidents, and especially blows.

Symptoms.—The symptoms vary according to the injury inflicted, from a slight faintness to a complete prostration, insensibility, and even death. The pulse is at first small and weak, then becomes irregular and extremely rapid, later imperceptible; the respirations are slow and shallow; the temperature is subnormal; the body is cold, and covered with a cold clammy sweat; the countenance is pallid and shrunken, the brow covered in cold sweat, the nose intensely cold. These symptoms may continue and death result, but in cases that will respond to treatment, reaction sets in.

Symptoms of reaction.—The pulse becomes fuller, more regular, and slower; the respirations increase in depth and frequency; the temperature rises; the surface of the body becomes warmer, sweating ceases; consciousness and muscular power are gradually restored; vomiting and irritability are often present.

Treatment.—In slight cases the treatment is that given for fainting (p. 547). In more severe cases, put the patient to bed with head low, raise the foot of the bed on blocks (6–12 inches high according to the amount of shock); rub the patient down with hot towels, cover him with hot blankets, an electric thermal pad, or blanket, applied to the abdomen, or radiant-heat cradle, are both most valuable means of raising the body temperature, and place carefully protected hot bottles around him. If conscious give frequent warm glucose or sweetened drinks. The surgeon may order either rectal or subcutaneous infusion (p. 82), or if the case is one of extreme collapse may perform intravenous infusion (p. 74). Stimulants may be ordered to be given by rectum (p. 60), subcutaneously (p. 82), or by mouth, if the patient is conscious, but must never be given without distinct medical orders in cases suffering from shock or collapse resulting from haemorrhage, or when haemorrhage is likely to occur.

Stimulants.—Stimulants given by mouth are: brandy, whisky, sal volatile, black coffee, glucose, bovril. By rectum: brandy, whisky, black coffee, solution of saline with glucose. Subcutaneously: saline solution, brandy, ether, strychnine, pituitary extract, adrenalin (see hypodermic table, p. 844).

Requisites necessary for treating shock.—In cases where shock is anticipated the following articles should always be in readiness: Hot blankets; hot bottles suitably covered; electric thermal pad, radiant-heat cradle; blocks; sterilized normal saline solution, hot and cold; ammonia; hypodermic syringe with strychnine, coramine, pituitary extract, adrenalin, brandy; black coffee; apparatus for rectal (p. 58), subcutaneous (p. 82), or intravenous infusion (p. 74); warm dry towels.

Prevention of shock.—In cases about to undergo an operation, the following points should be attended to as a prevention of shock: Administer the aperient 36–48 hours before the operation unless otherwise ordered, the aperient should be sufficient to thoroughly empty the bowels without causing excessive purging; do not starve the patient too long beforehand; keep as warm as possible and at rest; reassure and calm nervous patients. Give sugar, or glucose drinks, if allowed. (Preparation for operation, see pp. 460 and 500.)

A hypodermic injection of strychnine may be ordered before the operation, or it may be ordered three times a day for three or four days previously. Morphia, or morphia and atropine, is frequently prescribed to lessen shock, the injection is given 30–45 minutes before the operation (p. 450). Rectal saline 1 pint, either with or without brandy, may be ordered, and is given 1 hour before the operation; most critical operation cases may require intravenous infusion of saline or blood transfusion (p. 80) during the operation.

With certain extremely nervous patients about to undergo a critical operation some surgeons give instructions for them to have a certain amount of preparatory treatment each day. On the day of operation rectal anaesthesia (p. 451) is administered before removing them from the bed. In this way they are not aware that the operation is about to take place, and a certain amount of shock from fear is prevented.

Collapse.—Collapse is the term applied to a condition very similar in nature to shock, but differing mainly from it in its onset, which is more gradual and often preceded by some exhausting disease such as pneumonia (p. 251), infantile diarrhoea and vomiting (p. 597), cholera, etc.; any condition associated with loss or deprivation of fluids (dehydration) from the vessels may give rise to it, e.g. prolonged vomiting, diarrhoea, haemorrhage. If septic absorption is taking place at the same time the symptoms are more marked, thus in acute peritonitis (p. 512) the two factors are present, removal of the fluid from the circulation and toxaemia (p. 577). Collapse may follow shock and prove fatal; thus, after perforation of the stomach the immediate symptoms are due to shock, but they are quickly followed by the collapse due to acute peritonitis.

Treatment is that given under shock; the cause is treated, and treatment is given to counteract toxaemia if present. Transfusion of blood plasma is now proved to be of great value (p. 77).

HAEMORRHAGE

Haemorrhage is the escape of blood from blood-vessels. It is termed arterial, venous, or capillary according to the vessel from which the blood flows.

(*a*) In *Arterial haemorrhage* the blood is bright red and ejected forcibly, it can be controlled by pressure from above (the proximal side of the bleeding vessel), or elevation, if possible, and pressure on the bleeding point.

(*b*) In *Venous haemorrhage* the blood is a darker red and flows in a continuous stream, and is controlled by pressure from below (the distal side of the bleeding vessel).

(*c*) *Capillary haemorrhage* occurs as a general oozing, and may be controlled by direct pressure over the bleeding surface.

Causes.—(1) Traumatism, knife wounds, punctured wounds, crushing injuries, etc. (2) Disease of vessel walls, atheroma (p. 277), aneurysm (p. 278), or ulceration (p. 573), etc. (3) General diseases, haemophilia, purpura, scurvy.

Terms used to denote Haemorrhage from Various Organs:

Ecchymosis, subcutaneous haemorrhage when no external wound (p. 189) exists.

Extravasation of blood, the term applied to bleeding into the subcutaneous and deeper tissues; the area becomes swollen and tense.

Enterorrhagia, haemorrhage from the intestine (p. 222).

Epistaxis, haemorrhage from the nose (p. 667).

Gastrorrhagia, haemorrhage from the stomach (p. 217).

Haematemesis, blood vomited from the stomach (p. 217).

Haematoma, a subcutaneous, localized collection of blood (blood tumour).

Haemoptysis, haemorrhage from the lung (p. 259).

Melaena, partly digested blood passed by rectum (p. 186).

Menorrhagia, excessive haemorrhage in the menstrual period (p. 687).

Metrorrhagia, haemorrhage from the uterus between the menstrual periods (p. 687).

Petechiae, minute subcutaneous haemorrhages (p. 189).

Haemorrhage may be either (*a*) *primary*, (*b*) *reactionary*, or (*c*) *secondary*, classified according to the time it occurs. It is termed *external* when the blood is visible, *internal*, or *concealed*, when no blood is apparent; for symptoms see p. 511.

(*a*) **Primary Haemorrhage** may be arterial or venous, and is caused by the puncture or rupture of an artery or vein.

Treatment.—Direct pressure is applied, either digital compression (p. 566) or by tourniquet (p. 566). If the bleeding is from an artery, pressure is applied to the wound on the proximal side (nearest the heart); if venous, the distal side (farthest away); if capillary, over the bleeding surface. Cavities may be treated by packing with gauze or lint, and applying a graduated pad. Should these means not suffice, the surgeon may use one or other of the following methods:

Methods of arresting haemorrhage.—Forcipressure, by compressing the ends of the bleeding vessel between forceps with serrated ends (Spencer-Wells or haemostatic forceps). Torsion may be used after forcipressure instead of ligature. In some cases the vessel is twisted round and round whilst held in the forceps. Ligature consists in tying the vessel in its circumference. Cauterization, the actual cautery or Paquelin cautery (p. 96), may be used to sear the vessel. Hot water or saline at a temperature of 130°–160° F. is a powerful haemostatic for capillary haemorrhage (p. 563), but unless the water is hot enough to blanch the wound the bleeding will be aggravated instead of checked. Haemostatics are given (p. 767).

(*b*) **Reactionary Haemorrhage** is the term applied to bleeding occurring within 24 hours of an operation or accident. It may be caused by the slipping of a ligature, or the blood-clot in the divided vessels not being strong enough to resist the increased blood pressure which occurs when reaction from shock (p. 561) takes place or from the excited action of the heart due to straining, visitors, etc.

Treatment.—Elevation of the part, a hypodermic injection of morphia and the application of a firm bandage will generally be sufficient to stop this haemorrhage, but if not, the surgeon will probably reopen the wound and secure the bleeding points again.

(*c*) **Secondary Haemorrhage.**—This term includes all forms of haemorrhage occurring more than 24 hours after the accident or operation. It is usually due to infection of the wound.

Symptoms.—The bleeding is almost always preceded by symptoms of infection of a wound (p. 568), to which an occasional loss of blood is added. The earlier the haemorrhage occurs the less serious it is.

Treatment.—The patient must be constantly watched night and day, never being left for an instant without a responsible person in attendance. If the wound is in a limb, a tourniquet (p. 566) may be put in position, and tightened by the nurse if the bleeding occurs. When it occurs where a tourniquet cannot be applied, the artery supplying the part must be compressed by digital compression (p. 567) until the arrival of the surgeon, who should be summoned directly the bleeding occurs. The wound will probably be reopened and the vessel secured by ligature. When applying digital compression it is advisable to cut the bandage and remove the dressing, leaving the wound covered with gauze, if the artery cannot be compressed with the dressing in position. (For the treatment of internal or concealed haemorrhage see p. 511.) Plugging the wound with firm plugs of gauze soaked in peroxide of hydrogen or adrenalin will often suffice when the haemorrhage is not severe, or when it does not come from a large vessel. When the bleeding is a general oozing, capillary haemorrhage, and not from any one particular vessel, the following methods may be used:

Position.—Elevation of the limb or part.

Cold.—Ice, cold water, or lotion, or exposure to the air after removal of the clots.

Heat.—Hot water or lotion at a temperature of 130°-160° F. (p. 73). Actual cautery (p. 96).

Drugs may be used locally as styptics, or generally, to increase the coagulability of the blood. *Local styptics* are: liq. ferri perchloridi, adrenalin, tannic or gallic acid, alum, nitrate of silver, peroxide of hydrogen. When applying any of these drugs, the bleeding surface must previously be rendered as dry as possible, the styptic being applied on gauze or lint. *General drugs:* calcium lactate, given either by mouth or by rectum, opium may be ordered or a hypodermic injection of morphia to quieten the mind and body and so assist in the arrest of bleeding.

First aid.—Points to remember in regard to haemorrhage.—Send for the surgeon, apply treatment such as digital compression (p. 567) or firm pad and bandage immediately whilst awaiting orders. Elevate the part if possible, keep the head low (unless the haemorrhage is from the head), raise the foot of the bed on blocks. On no account give stimulants, unless ordered by the surgeon, until the bleeding point has been secured. Rectal saline (p. 58) may be administered if the patient is becoming very collapsed, or subcutaneous infusion (p. 82) if rectal is impossible. Open the windows, calm and reassure the patient and keep as quiet as possible. Water may be given to drink, as the patient will complain of thirst. In severe cases, the patient's arms and legs should be bandaged from below upwards, with flannel bandages in order to keep the blood in the head and vital parts. If the bleeding point is in the head, raise the head of the bed on blocks, or the patient's head may be raised on several pillows. (Internal haemorrhage, see p. 511.)

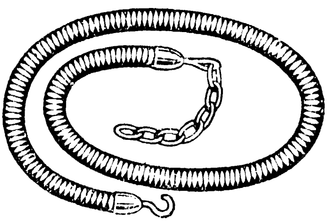


FIG. 208. Esmarch's tourniquet.

Tourniquet.—A tourniquet consists essentially of a band to encircle the limb and of an apparatus whereby the band may be sufficiently tightened to arrest the flow of blood in the main artery leading to the wound. A pad over the artery adds to the efficacy of the apparatus and should always be used if possible. Dangers of applying a tourniquet are: If the tourniquet is applied too tightly, or continued in position for too long, the circulation of the blood to the parts beyond the spot where it is applied may be so completely arrested as to produce gangrene, or injury to tissues beneath the tourniquet may occur.

To apply a tourniquet.—Elevate the limb, apply the tourniquet with just sufficient pressure to arrest the haemorrhage, relax and tighten the pressure every 10 or 15 minutes until the wound can be attended to by the surgeon.

Elastic tubing tourniquet (*Esmarch's tourniquet*, Fig. 208).—This consists of a piece of rubber tubing with metal hooks at either end. The tubing is stretched round the limb for two or three turns and then fastened by means of the hooks.

Improvised tourniquet (Plate XXXIIIA).—Apply a pad, then a bandage or folded handkerchief over the artery to be compressed, take a pencil stick, key, poker, or other rod, fix it in the knot securing the bandage or handkerchief and twist until the required pressure is obtained, fasten the rod in position by tucking the end, if a pencil or short rod, under the bandage, or if a long stick is used, by tying its ends above and below (Plate XXXIIIB).

Digital Pressure.—This term implies compression of the artery between the finger and the underlying bone, and is performed when it is impossible to apply a tourniquet, or as an immediate means of arresting haemorrhage until a tourniquet can be adjusted. It is difficult without experience to make digital pressure sufficiently firm to control haemorrhage for any time, therefore, when practical, a tourniquet is the more reliable method.

When about to apply digital compression, first feel for the pulsation of the artery to be compressed, then apply firm steady pressure proximal to the bleeding point, sufficient to arrest the haemorrhage but no more, elevate the part. The principal points at which the various arteries may be compressed, i.e. the digital point, are as follows:

The **Ulnar Artery**, against the ulna on the inner surface of the side of the little finger. The **Radial Artery**, against the radius on the inner surface of the thumb side. Flex the elbow and raise the hand (Plate XXXIIIc). Used for haemorrhage from the hand.

The **Brachial Artery**, against the humerus, on the inner surface of the upper arm between the two large muscles, about one-third of the distance between the axilla and elbow (Plate XXXIIB). To arrest haemorrhage in the arm or hand.

The **Subclavian Artery**, against the clavicle from behind, about midway between the point of the shoulder and the sternum (Plate XXXIIA). To arrest haemorrhage from the axilla or shoulder.

The **Carotid Artery**, against the spine; grasp the middle part of the windpipe gently between the finger and thumb, and on pressing the tips backwards the pulsation of both vessels may be felt, apply pressure by pressing the fingers or thumb in a backward direction (Plate XXXIIc). To arrest haemorrhage from the neck, mouth, and tongue.

The **Temporal Artery**, against the zygoma where the pulse may be felt, directly in front of the ear. To arrest haemorrhage from the scalp.

The **Facial Artery**, against the lower jaw bone, at a point below the angle of the mouth, at the interior edge of the masseter. To arrest haemorrhage from the face.

The **Abdominal Aorta**, against the spine a little to the left of the umbilicus. To arrest internal haemorrhage as a last resource.

The **Femoral Artery**, against the rim of the pelvis in the groin, about two-thirds of the distance between the hip to the middle line of the body. To arrest haemorrhage from the leg.

The **Popliteal Artery**, behind the knee against the femur. Place a pad behind the knee and flex the knee acutely. To arrest haemorrhage below the knee.

INFECTION

Infection consists in living virulent bacteria gaining access to tissues on which their toxins will act, the sign of infection is inflammation. (For full description see bacteriology, p. 823.)

1. **Inflammation** is the reaction of healthy tissues to injury. The cause is most commonly bacterial infection (p. 833); other causes include exposure to X-rays, excessive heat or cold, mechanical cause, Bier's passive congestion (p. 104). The stages of inflammation are:

(1) *Hyperaemia* (p. 190).—The blood-vessels dilate, resulting in a larger blood supply to the part. Sign: redness.

(2) *Stasis.*—Owing to the dilatation of the vessels, the blood rate of flow is slower—congestion (p. 190).

(3) *Exudation of lymph and migration of leucocytes.*—Owing to the increased vascularity of the capillary vessels, and the slower rate of the blood stream, the leucocytes migrate through the walls and act as phagocytes (p. 838), serum containing fibrin antitoxin and some red cells also exudes.

(4) *Proliferation of cells.* — Resulting from the changes enumerated, proliferation of the connective tissue cells, endothelial and fibroblastic. Results: The endothelial cells form new vessels; the fibroblastic cells form fibrous tissue, which contracts, forming scar tissue.

The *local symptoms* are: Redness, swelling, heat, pain, and impairment of function.

Constitutional symptoms.—In addition to local signs in the wound, the following symptoms may be present in a varying degree: Rise of temperature and pulse; furred tongue, in the later stages the lips may be covered with sordes; impaired appetite and imperfect digestion; the bowels may be constipated or diarrhoea may be present, the motions often being offensive; urine scanty and high coloured with an unusual quantity of urea and urates; dry skin. If these symptoms continue, the patient becomes thin and emaciated. Inflammation may end in either (*a*) *resolution* or (*b*) *suppuration.*

(*a*) *Resolution* is the term applied to the gradual disappearance of the signs of inflammation, so that healing of the wound or organ takes place. The cells in the inflamed area broken down by the phagocytes, are absorbed by the lymphatics. Some tissue remains for a time, but may be removed by the phagocytic action, leaving the tissues as they were before; the inflammation is then said to have 'resolved.' A good example of 'resolution' is that of the lung in pneumonia. (For healing of wounds see p. 517.)

Treatment.—Removal of the cause if possible; the inflamed part is kept at rest; the supply of healthy blood to the part is increased by means of heat, fomentations (p. 90), spirit compress (p. 94), counter-irritation (p. 96), or in the case of a limb treatment by irrigation envelope (p. 101) or a bath may be ordered; free drainage is secured so that all discharge may have a free outlet; antiseptic lotions and dressings are applied to prevent mixed infection; activity of the skin, kidneys, and bowels is induced in order to eliminate toxins from the body; nourishing, digestible food in as great a quantity as can be assimilated is administered. Stimulants are frequently ordered. Drugs may be prescribed either for stimulating, or for the reduction of the temperature. If hyperpyrexia is present cold or tepid sponging (p. 111) may be ordered. The patient should be washed all over daily to promote and remove perspiration. (For general nursing see p. 460.)

(*b*) *Suppuration.*—Suppuration is the formation of pus in the inflamed tissues, caused by exudation of lymph and cell destruction. It is the residue of liquefied cells, bacteria, and phagocytes which are not absorbed, and form ***pus***, resulting in either an abscess, which is a localized collection of pus in the tissues, or in *cellulitis*, which is a condition in which the cellular tissue of a part is diffusely infected, the pus spreading and burrowing deeply.

Symptoms.—The symptoms are those of inflammation, and in addition in some cases the pus may be detected by feeling for fluctuation, in others it may be seen as when suppuration occurs in an open wound.

Treatment.—Until the pus is ready to be let out the treatment is that given under inflammation; the part is then incised and drained, and treated with antiseptic lotions and dressings (see abscess, p. 518). *Cellulitis* is usually accompanied by intense pain; drugs may be necessary for the relief of pain and to procure sleep and rest. The glands in the vicinity of the wound may become inflamed and suppurate.

Complications.—Complications which may occur are: Septicaemia (p. 575), pyaemia. Lardaceous disease (p. 581) may supervene in long-standing chronic suppuration.

Treatment of Infected Wounds.—The following methods are commonly used in the treatment of septic wounds:

(1) Irrigation of the wound with an antiseptic lotion after the use of hydrogen peroxide, followed by an antiseptic dressing or fomentations. If a dressing (p. 440) is used it may require to be changed two or three times a day, or oftener. Fomentations are usually changed every two, three, four, or six hours; they may be made with either boracic, perchloride of mercury, carbolic, or any

other antiseptic preferred by the surgeon (see fomentations, p. 90). When dressing, or changing a fomentation on a septic wound, the nurse must take every precaution to prevent further sepsis or infection of the wound (see after-dressings, p. 440).

(2) *Irrigation envelope* (p. 101) is the modern closed method, and is much more efficacious than the open method described below. *Open irrigation of the wound* with either warm normal saline solution, or a weak antiseptic solution. *Method.*—The limb is suitably arranged over a receptacle to catch the fluid. The lotion (temperature 100°-105° F. or as ordered) is placed in a clean douche can or thermos flask apparatus (Fig. 17) and arranged above the wound so that the lotion flows over it in a gentle continuous stream. Usually ordered for a certain number of consecutive hours daily, the wound in the interval being covered with a dressing. The wound is covered with a piece of gauze during the process, the saline dripping on to the gauze. The apparatus needs constant attention, both as to refilling and maintaining the temperature.

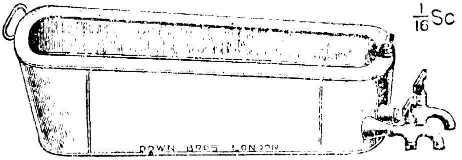


FIG. 209. Arm bath.

(3) *Regional antiseptic bath.* — Immersion of the limb in a bath (Figs. 209, 210) containing a weak antiseptic solution may be ordered (see baths, p. 116). The lotion used may be carbolic, Lysol, perchloride of mercury, Eusol, normal saline solution, iodine, etc. (See table of antiseptic lotions, p. 843.)

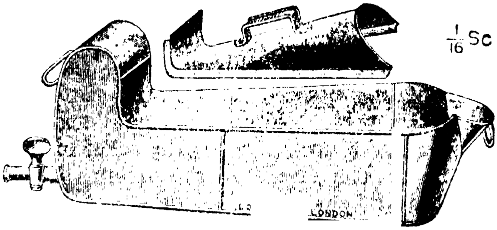


FIG. 210. Leg bath.

(4) *Hypertonic saline treatment.*—The wound is packed from below upwards with sodium chloride tablets in such a manner that it is filled with the tablets, it is then covered with gutta-percha tissue and over this a large quantity of absorbent wool is applied and bandaged in position. The pack remains in position 48 hours, more wool being packed on as required as the salt causes much exudation;

the top layer of wool may be changed if necessary when repacking the dressing (see packing, p. 442). At the end of 48 hours the wound is dressed, and after cleansing, a wet dressing of normal saline solution is applied, or an antiseptic dressing may be ordered. If necessary the saline pack is repeated the following day, or after an interval of two days.

(5) *Penicillin.* See Chemotherapy, p. 840.

(6) *Urea.*—Since every wound covered with slough or debris is a potential breeding-ground for bacteria, the removal of such tissue deprives the bacteria of a medium in which to grow and thus prevents reinfection of the wound. The protein solvent properties of urea render it most efficacious in wounds of this description, i.e. in all cases of sepsis where sloughing is present, also chronic varicose ulcers (p. 573), slow healing traumatic wounds, carbuncles (p. 414). The advantages of urea as a dressing for wounds are: It is a substance that is readily obtainable in quantity and is both cheap and stable; it is simple to apply, daily dressing only is usually sufficient; it deodorizes offensive odour.

Application.—(*a*) *Small shallow areas of infection.* The wound is soaked for 15 minutes in a hot, saturated solution of urea, then dried. To prevent any redness or excoriation of the surrounding skin, zinc cream is applied. Urea crystals are then placed directly on the wound, filling the cavity completely; a gauze dressing is then applied and firmly bandaged. After 3 or 4 days a definite improvement is noticed; discharge is less, and signs of granulation (p. 518) are present. In small areas of infection (septic fingers, etc.), the use of urea will usually complete the healing; in larger wounds an epithelializing agent may be required to complete healing. Cases with bone necrosis take from three to four weeks before healing is complete.

(*b*) *Carbuncles.* After the initial incision and removal of necrotic tissue, the cavity is packed with urea crystals. Daily dressing is by syringing out the cavity with a saturated solution of urea, drying the cavity, applying zinc cream to the surrounding healthy skin, filling the cavity with urea crystals and covering with waxed paper, wool, and bandage. If the dressing is inclined to stick owing to excessive discharge, a gauze dressing is preferable to the waxed paper for a few days until the discharge is less.

(*c*) *Chronic ulcers.* The dressing is that described for carbuncles. The sloughing base always present in these ulcers is removed in 4 to 5 days, revealing a bright red, granulating area which gradually becomes smaller until healed.

Cases which require an epithelializing agent to complete healing are treated with either red lotion, or an application of glycerine alum, and zinc. Pain may be severe for an hour or so after application of the urea crystals at the commencement of the treatment, and may require luminal or aspirin for its relief.

2. **Acute Traumatic Osteomyelitis.**—This term is applied to inflammation of the bone which arises as a result of infection from without, e.g. after operations on bone, amputations (p. 472), excision etc., or following an injury to the bone, such as compound fracture, etc. (p. 527).

Symptoms.—The symptoms are those of inflammation, with great pain and tenderness of the limb. The onset is ushered in with a rigor, the temperature remaining high although it may be remittent (p. 196). The condition is often fatal unless early and prompt treatment is undertaken, as the patient runs considerable risk of pyaemia (p. 577) or acute toxaemia (p. 577). The inflammation of the bone in severe cases is followed by necrosis, or death, of a part of the bone. Should the patient survive, the necrotic tissue gradually separates, and during this process a mass of new bone is formed from under the surface of the periosteum. The necrosed bone in the healthy bone is termed a sequestrum (p. 518). In mild cases suppuration and necrosis may not take place, the inflammation ending in resolution (p. 568).

Treatment.—An operation is undertaken to open up and drain the bone and surrounding tissues. (For preparation and after-treatment of operation cases see p. 460.) The limb is kept at rest on a suitable splint, or plaster cast (Plate XII), that will not require removal when the wound is dressed. The dressing will probably require changing daily or more often. *Diet.*—The food is most important, nourishment of a suitable kind must be given in as large a quantity as can be assimilated, extra milk, cream, butter, etc. Stimulants are often prescribed if the case is a severe one. Rectal saline (p. 58) is commonly ordered if there is much toxaemia. Sulphathiazole (M & B 760) is given (see p. 776).

Temperature and pulse are taken 4-hourly until normal.

Nursing.—Care is necessary in attending to these cases, as the least knock or jar against the bed causes acute suffering. The limb should be disturbed as little as possible when bedmaking, etc., and should be gently but firmly supported by a second person whilst the sheet, etc., is attended to. Fresh air is most important, but the patient must not be placed in a draught. The bowels need careful regulation, the surgeon being informed if an aperient is necessary. Later, tonics and change of air are ordered. (For general nursing see p. 460.) A second operation may be necessary for the removal of the sequestrum (sequestrotomy).

The *complications* are: Pyaemia, septicaemia, thrombosis.

3. **Ulceration.**—An ulcer is an open wound or sore affecting the

skin or mucous membrane, attended by discharge. It is probably due to pyogenic infection. An ulcer may be pyogenic, trophic, traumatic, or specific, and may occur internally (gastric ulcer) or externally.

Causes.—Traumatism, specific bacteria, e.g. syphilis (p. 322), tuberculosis (p. 318), malignant disease (p. 314). Malignant ulcers may be either rodent, scirrhous, or perforating. There are three stages through which an ulcer passes before healing. 1st stage is that of extension; 2nd stage, transition period, that is, a period in which the ulcer is neither healing nor spreading; 3rd stage, repair, or healing.

Treatment of external ulcer.—The part is supported and kept at rest and protected from irritation. Soothing or stimulating drugs are applied to the surface of the ulcer according to its condition. Before treatment the wound may be cleansed under an anaesthetic. Irrigation envelope (p. 101) has proved successful in many of these cases. Varicose ulcers (see varicose veins, p. 279). The general health of the patient is attended to, and a liberal nourishing diet is given. Patients suffering from ulcers due to syphilis or tuberculosis are treated as described under these diseases (see Chapter X). Malignant (*rodent*) ulcers are treated by excision if practicable, or by X-ray or radium (p. 729).

Treatment of internal ulcers.—(See p. 219.)

4. **Gangrene.**—By this term is meant death or necrosis of local tissue with putrefaction of the necrotic tissue. It is brought about by obstructed circulation in the part whereby the nutrition is cut off and the tissue dies.

Causes.—Trauma; chemical injury; thermal injuries, such as burns (p. 521), frost bite (p. 525); nutritional diseases associated with vascular disturbance such as diabetes (p. 289), Raynaud's disease (p. 381), senility, thrombosis (p. 281), embolism (p. 282); infection, when the tissues are destroyed by organisms, as in cancrum oris (p. 215), carbuncle (p. 414), gas gangrene (p. 574); drugs, ergot, etc.

Symptoms.—The symptoms include: Loss of pulsation in the vessels; loss of heat; loss of sensation, although great pain may be present whilst the part is dying; change in colour: the colour varies according to the amount of blood in the part at the time of death—if anaemic it is creamy waxen colour, if full of blood it becomes purple, mottled, or black. These symptoms may be present before death in the affected part has actually taken place; if the part is not quite dead, some alteration in colour occurs on pressure.

Various kinds of gangrene are: (*a*) *Dry gangrene*, occurs when the limb has been more or less drained of fluid. Colour, black or dark greenish brown; the necrosed part is mummified, wrinkled, and hard.

(*b*) *Moist gangrene* occurs when the part is full of fluid at the time of death, the necrosed tissue remains soft and often liquefies.

Aseptic moist, remains much the same size and is eventually cast off without further inflammatory trouble. Colour, purple, yellowish green, or black.

Treatment.—There are three guides to the best position for the affected limb, i.e. comfort, colour, temperature. The limb is generally most comfortable when a little *below* the horizontal, this can be arranged by putting blocks under the head of the bedstead. The limb should be as near the natural colour as possible, neither too blue nor too pale. It should also approach the normal temperature, if placed too high or too low the limb will be cold. When the limb is elevated it looks dead, and will die if kept up, for hardly any blood can get to it. The best way to apply warmth is by sterile gauze or wool lightly bandaged. If actual gangrene is not present a warm bath daily to render the limbs pink will assist, and the operation of sympathectomy may have to be performed. Amputation may be necessary.

A generous stimulating diet is required. Smoking is forbidden. Tonics and stimulants are ordered.

Avoidance of pressure is imperative. A cradle and ring heel pad are required for a lower limb. Artificial heat should not be applied. The cause is treated.

In cases in which gangrene occurs in a part other than a limb, such as a carbuncle in the nape of the neck, the necrosed tissue is excised and the wound subsequently disinfected with pure carbolic acid. For treatment of septic wounds see p. 569. Healing takes place by granulation.

Gas gangrene.—Caused by infection with the Bacillus aerogenes capsulatus, or the Bacillus oedematis maligni. It occurs most commonly as a complication of gun-shot wounds. Blebs form containing putrid serum, also bubbles of gas, and the part undergoes rapid disintegration. The colour may be purple, yellowish green, or black.

Symptoms.—The onset and progress of the gas distension of a limb which precedes the gangrene may be extremely rapid, a patient within six hours of receiving a wound in the thigh has been known to have gas extended to the axilla. The toxaemia is so fatal as to be unparalleled. Within a few hours of the onset of the physical signs of gas extensive gangrene may develop in the wound. Life depends on rapid and immediate amputation with the minimum of shock, treatment with antitoxin. Intravenous ether anaesthesia is frequently used in these cases. Pain is very severe as the gas distends the limbs, but when gangrene sets in the pain disappears. Infection may become general, extreme pallor is a symptom of general infection, death occurs in general infection from cardiac failure or air embolism.

Treatment. — Vaccine treatment is given. Hypertonic saline treatment (p. 570) may be used for the wound, or the limb may be artificially distended beyond the gas distension with hydrogen peroxide to prevent a spread of infection. Saline may be ordered either by rectal, subcutaneous, or intravenous infusion (see Chapter III). Stimulants are ordered and everything possible is done to maintain the patient's strength until the toxaemia is overcome. The smell of the wound due to the gas may be almost unbearable, and cannot be successfully masked by any deodorant.

5. **Septicaemia.** — Septicaemia is an acute general infective disease

Cause.—The cause is the entrance into the blood of pyogenic organisms and their toxins, they gain entrance as a rule through an infected wound.

Symptoms.—The symptoms include: Rigor (p. 207), high temperature, 104°-105° F., remaining high at night, being lower in the morning (see chart, Fig. 211); rapid feeble pulse; the skin may have a yellowish tinge, petechiae (p. 189) may be present; loss of appetite, the tongue is dry and furred; diarrhoea with the passage of blood-stained mucus; delirium (p. 210); dyspnoea (p. 205) followed by coma (p. 360) and later death, unless efficient treatment is quickly resorted to. A fall of temperature with a rapid pulse is a very grave symptom.

Treatment.—The poison is eliminated if possible. The wound is commonly opened up, purified, and free drainage provided. In some cases when the wound is in a limb, amputation may be performed (p. 475), but very few of these cases recover as the organisms have already reached the blood. Serum treatment is prescribed, and if given in the early stages is very successful. Liquid nourishing and digestible diet is given in as great a quantity as can be taken and digested. Stimulants, either brandy or whisky, are prescribed in large and frequent doses, an adult may be ordered from 6-8 ounces in 24 hours. Rectal injections of saline (p. 58) given every 4 hours, or continuous rectal saline is very beneficial in many cases. If diarrhoea is present, the saline is given subcutaneously (p. 82). Recovery depends on whether the patient's strength can be maintained until the toxins have been eliminated or the patient has been rendered immune.

Nursing.—Very careful nursing is necessary. These patients are

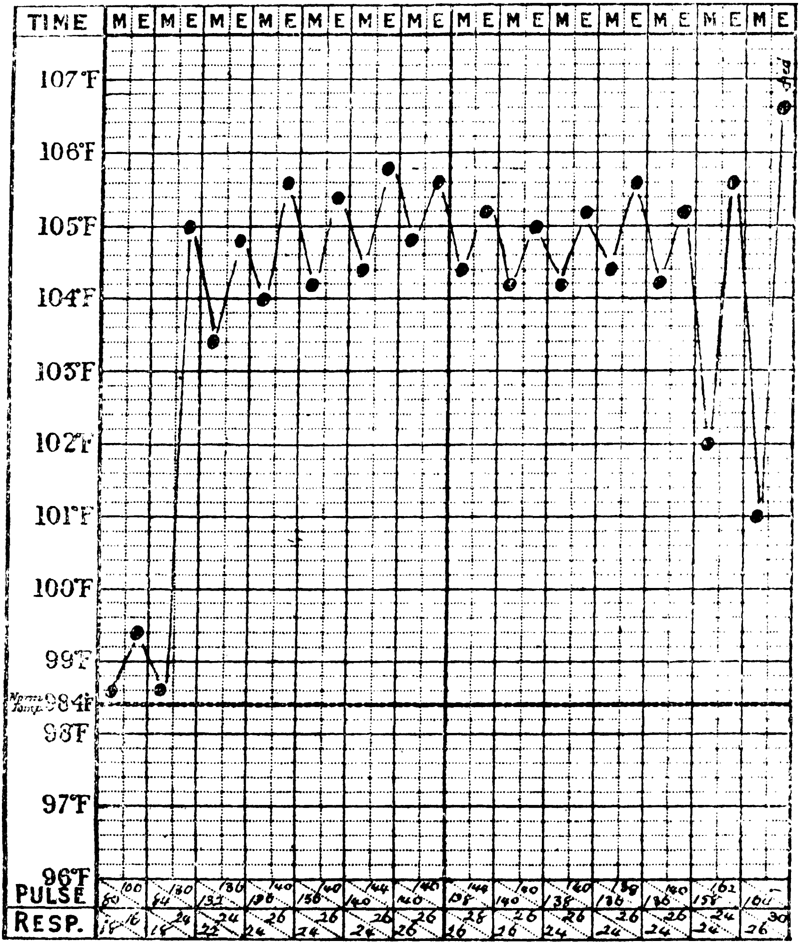


FIG. 211. Temperature chart of a case of septicaemia.

very liable to bedsores (p. 17), perfect cleanliness of the whole body must be maintained by daily blanket baths (p. 11). (See also nursing of specific infective diseases, p. 316.)

6. **Pyaemia.**—This is a disease closely allied to septicaemia, and is really another form of that disease.

Cause.—Septic material in the circulation becomes implanted in various parts of the body, causing metastatic abscesses.

Symptoms.—The symptoms commence with a rigor (p. 207) which is repeated at regular intervals of about 24–48 hours (see chart, Fig. 212). The rigors are followed by profuse sweating, the temperature may fall to normal between the rigors, but most commonly remains above; the pulse is rapid, soft, and weak. The skin is hot and develops a brownish tinge with petechial (p. 189) patches. The breath has a characteristic odour resembling that of new-mown hay. The mouth is dry, the tongue is often red with prominent papillae and later becomes brown (p. 207). The excretions are diminished. Great depression is present, and the body wastes rapidly. Nocturnal delirium (p. 359) is common. Secondary abscesses occur about the end of the second week, they form rapidly and without much pain. In the chronic form of pyaemia, the abscesses are fewer in number, the symptoms are less marked, and recovery is more likely to take place.

Nursing.—The patient must be carefully looked over twice a day in order to detect any abscess that may have formed. A daily blanket bath is a necessity and the nurse has then a good opportunity of noticing any swelling, or sign of abscess. Abscesses may occur in any part of the body or visceral organs; places in which they commonly occur are: the back, the arms, thighs, and pectoral region. The treatment is that described under septicaemia, and in addition as the abscesses point they are opened and dressed with an antiseptic dressing, strict aseptic precautions being taken when the wounds are dressed in order to prevent further infection (p. 568). (For the treatment of rigor see p. 207; for general nursing see p. 460.)

Unfavourable symptoms are: Fall in temperature with continued rapid pulse and respiration; hiccough (p. 208); persistent vomiting; diarrhoea; persistent hyperpyrexia; delirium (p. 210); coma (p. 360).

Complications which may occur are: General toxaemia; collapse (p. 562); thrombosis (p. 281); embolism (p. 282); infarction (p. 282); the typhoid state (p. 210); reinfection of the blood stream.

7. **Acute Toxaemia.**—Acute toxaemia is a form of poisoning resulting from the absorption of a large dose of toxins (p. 829) from some focus of infective inflammation of sufficient extent and virulence. It differs from septicaemia and pyaemia in that only the toxins

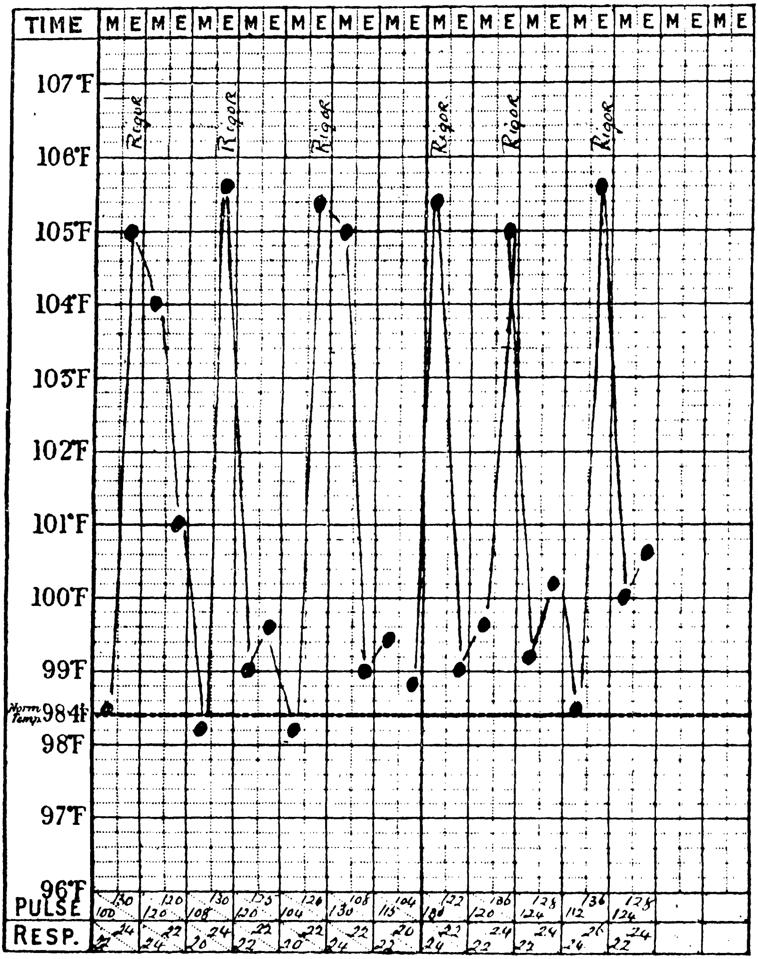


Fig. 212. Temperature chart of a case of pyaemia.

without the bacteria gain access to the blood stream. Toxaemia is not unfrequently associated with true septicaemia.

Symptoms.—Fever is present, except in some of the gravest cases, when the temperature may be subnormal although the pulse still remains high. Other symptoms are: Loss of appetite, a dry tongue, a quick pulse, rapidly becoming weak, severe headache, and nocturnal delirium of some intensity. Constipation is present at first, but vomiting and diarrhoea may ensue, followed by fatal exhaustion and collapse (p. 562); or the patient may become comatose and unconscious and merge into the typhoid state (p. 210) before death. Dyspnoea may occur from pulmonary, and albuminuria (p. 236) from renal, congestion. Effective treatment of the case may lead to a rapid disappearance of the symptoms, but in spreading inflammation the toxaemia may not subside for some time.

Treatment.—The cause is treated and removed if possible. A purge may be ordered in the early stages, later a stimulating and supporting treatment is prescribed. Saline infusion, either rectal (p. 58) or subcutaneous (p. 82), is commonly ordered. A liberal nourishing diet is given. The temperature, pulse, and respiration are taken every 4 hours until normal. Careful nursing is necessary and the patient must not be allowed to exert himself until the medical attendant gives permission. Later, tonics and a change of air are prescribed. Fresh air is a necessity throughout the treatment.

Complications which may arise are: The typhoid state; septicaemia, pyaemia, collapse.

8. **Traumatic Fever.**—Traumatic fever may be due to sepsis of the wound as already described under infection, or it may occur after accidents, compound injuries, and operations when microorganisms are absent, it is then termed aseptic traumatic fever.

Causes.—Absorption of fibrin ferment or some other substance which has an irritating effect, such as antiseptic lotions, etc.; retention of serous discharges, blood-clot, haematoma (p. 563); or external irritation such as pressure from a badly fitting splint, etc. (p. 18), are common causes.

Symptoms.—The temperature rises to 100°–101° F., the pulse-rate is increased, the tongue coated, and with loss of appetite. The fever usually continues for two or three days, then subsides.

Treatment.—The cause is removed if possible. The bowels are carefully regulated, an aperient is usually prescribed, very commonly calomel followed by a saline draught, the latter being repeated each morning if necessary. The diet is light until the temperature becomes normal.

9. **Traumatic Delirium** is a form of acute delirium (p. 359) which

may accompany severe accidents or injuries with infection of the wound.

Symptoms.—The symptoms are: Delirium which is more marked at night, loss of appetite, distaste for food. Restlessness, but not usually of a violent type. It occurs about the end of 48 hours, and subsides as the temperature falls.

Treatment.—The patient must not be left alone. The injured part is protected from any injury which might be caused by the restlessness, the patient may be able to move the injured part without pain during the delirious period. A fractured leg may be swung in a Salter's cradle instead of being fixed to the bed if there is much restlessness (Fig. 178A, p. 360). The patient can be easily restrained as a rule by firmness and tact on the part of the nurse. Nourishing food is necessary and the nurse must see that it is taken, there may be a little difficulty at first which can usually be overcome by gentle persuasion. The bowels are kept freely open. An ice-bag (p. 92) may be ordered for the head. Drugs are usually prescribed to promote sleep. In other respects the nursing and treatment are as described under infected wounds.

Delirium of a Low Muttering Type is met with in individuals of low vitality, exhausted by dissipation, drink, disease, or faulty hygienic surroundings.

Symptoms.—The patient lies on his back, staring vacantly upwards, is incoherent, takes no notice of his surroundings, and is observed to mutter to himself unintelligibly, and to pick at the bedclothes (carphology, p. 208). There may be, in addition, incontinence of faeces and urine. The mouth is generally open, the tongue dry, brown, and cracked, and sordes (p. 189) collect on the teeth.

Treatment.—The treatment consists in careful nursing. Scrupulous cleanliness of the whole body (p. 11), with care in the prevention of bedsores to which these patients are particularly liable (for prevention of bedsores see p. 17). The mouth needs constant cleansing (p. 15). Nourishing food is administered at short intervals. Stimulants may be prescribed. The bowels need careful regulation, enemata (p. 60) may be ordered. Fresh air is most necessary and the patient must be kept warm.

Delirium Tremens.—This is a very violent form of delirium, it is a common complication of severe accidents or injuries occurring in persons of intemperate habits. (For symptoms and treatment see p. 359.)

Thrombosis, Embolism, and Infarction may result from an infected wound (for symptoms and treatment see Chapter VII).

LARDACEOUS DISEASE, OR AMYLOID, OR ALBUMINOID DISEASE

A disease in which waxy changes occur in various organs.

The *cause* is long-continued suppuration. The suppuration is the cause of toxic compounds circulating in the blood, whereby the walls of the small arteries, and subsequently the protoplasm of certain viscera, are infiltrated with, or become converted into, a waxy substance, from which lardacein may be obtained.

Symptoms.—The organs most commonly affected are the liver, spleen, kidneys, and the villi of the intestines.

The liver becomes enlarged, and the digestive processes are interfered with, especially that of absorbing fats.

The kidneys become enlarged. The urine is at first pale and abundant and contains hyaline and fatty casts; later the quantity is diminished, the specific gravity is raised, and a considerable amount of albumin is present. The spleen becomes enlarged. When the villi of the intestines are affected, absorption of food is decreased and increased transudation of fluid from the blood takes place, causing diarrhoea. The strength of the patient fails rapidly as less nutriment is being absorbed and increased excretion is taking place. The temperature is of the hectic type (p. 200).

Treatment.—Removal of the suppurating tissue, either by excision or amputation if possible, otherwise the wound is rendered as clean as possible, by antiseptic treatment Vaccine treatment. Open-air treatment and exposure to the sun are often beneficial.

SPECIFIC INFECTIVE DISEASES

1. **Erysipelas.**—An infectious disease due to infection with the Streptococcus erysipelatosus, characterized by inflammation of the skin or mucous membrane.

Mode of infection.—By direct contact, by fomites, by the air. It often occurs in connection with a wound or abrasion of the skin or mucous membrane (traumatic erysipelas). It is termed idiopathic erysipelas when it occurs apart from a wound.

Incubation period.—Three to seven days.

Symptoms.—The onset is sudden, with shivering, high fever, vomiting, and headache. Albuminuria (p. 236) is common, and diarrhoea (p. 186) may be present. The inflammation, i.e. the rash, in traumatic cases starts at the edge of the wound. In idiopathic cases, it usually begins at a junction of skin and mucous membrane such as the mouth, eye, or nostril, the head and face are the most common sites in these cases. The rash appears on the first day;

the skin is red, swollen, and tender, and bullae (p. 189) may develop. Great swelling of the cheeks, eyelids, and ears may take place. One or both sides of the face may be affected. The margin of the affected area is well defined and raised. The inflammation may spread very rapidly, and may spread in one direction whilst subsiding at another.

In severe cases, delirium is present and the typhoid state (p. 210) may ensue. Defervescence is by crisis (p. 193) and occurs at the end of a week or 10 days (see chart, Fig. 213). The inflammation ceases to spread when the temperature falls. The rash gradually fades and is followed by desquamation (p. 189).

Treatment.—The following local applications may be employed: Fomentations (p. 90) and ichthyol. The latter is painted all over the inflamed area, extending beyond the margin; it may be covered with a fomentation, or dry lint is bandaged in position. Some physicians use only a dusting powder over the inflamed area, keeping it dry, the surrounding healthy skin being painted with iodine. The drugs prescribed include perchloride of iron and drugs for the relief of pain and insomnia; antiscarlatina, or antistreptococcal serum may be given, or vaccine treatment. Stimulants are often necessary. The *diet* should be liquid and nourishing, i.e. milk, egg-flip (p. 816), albumin water, milk-bovril, etc. After the crisis solid food is allowed, the patient being fed up as much as possible. Hyperpyrexia is treated by cold or tepid sponging (p. 111). A change of air is necessary during convalescence.

Complications.—The following complications may arise: Oedema of the glottis (p. 668), cellulitis (p. 569), pneumonia (p. 251), ulcerative endocarditis (p. 272), nephritis (p. 241), arthritis (p. 311), meningitis (p. 374), otitis media (p. 656). Relapses are common. Baldness may result if the inflammation affects a hairy part. Chronic tumours and skin diseases may be cured or undergo improvement after an attack of erysipelas.

Period of isolation.—One week after the rash has ceased spreading.

Quarantine.—Ten days.

2. **Tetanus.**—Tetanus is a local infective disease with general toxaemia.

Cause.—Due to specific bacilli, the Bacilli tetani; generally contracted through an open wound or abrasion, but may be idiopathic. The bacillus is most commonly found in garden soil, stable refuse, mud, or dirt, so that a wound coming into contact with these is most likely to become infected.

Symptoms.—The symptoms comprise spasmodic contractions of the muscles with locking of the jaw. The muscles of the jaw and throat are the first to become affected, then the face, trunk, and

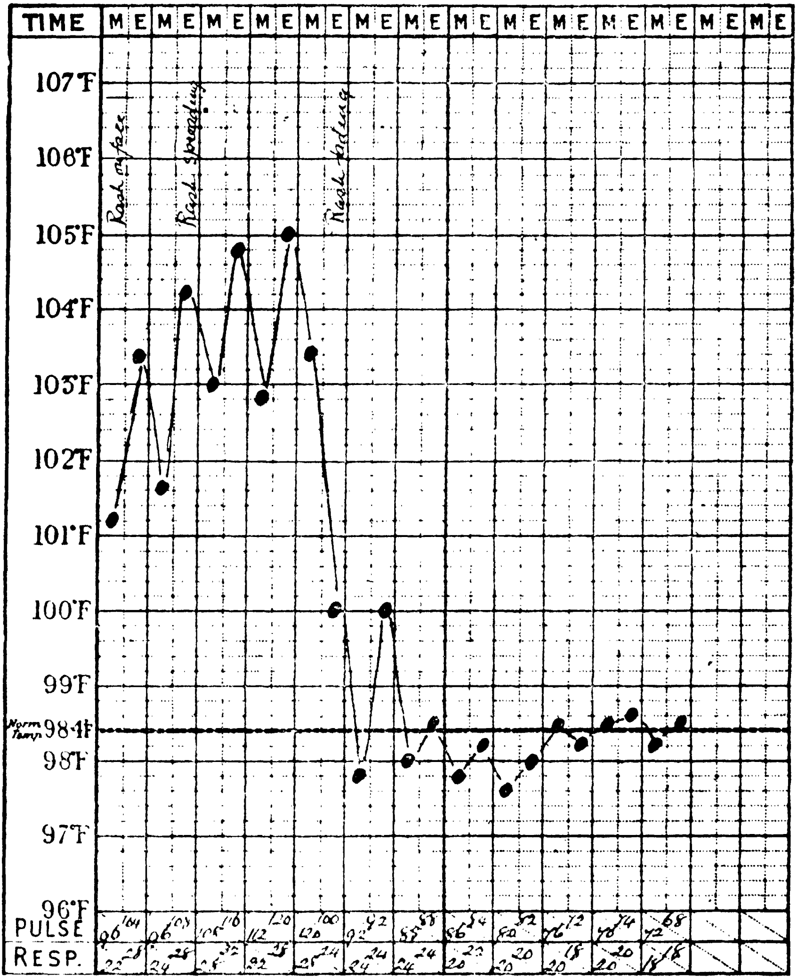


FIG. 213. Temperature chart of a case of erysipelas.

limbs. The contraction of the facial muscles gives the face a peculiar expression of grinning known as the 'risus sardonicus.' During the spasms the body goes through violent contortions, the most common being *opisthotonos*, i.e. arching of the back, throwing forward the abdomen so that the patient is supported on his head and heels. The body is sometimes bent forward in the opposite way, i.e. *emprosthotonos*. The contractions may be so violent as to produce rupture of the muscles. The respiratory muscles are the last to become affected.

During the spasm the face is livid, the body covered with sweat. The temperature is usually raised, but this is not always the case. The intellectual faculties remain clear until the end, which is generally caused by exhaustion due to repeated spasms, or asphyxia.

Treatment.—Antitetanic serum is injected (p. 85), and is the only form of treatment which is of any use. The wound is opened up and scraped and in some cases amputation is performed. The antitoxin may be injected in the neighbourhood of the wound, or into the spinal canal by lumbar puncture (p. 86). In some cases lumbar puncture and subsequent injection of magnesium sulphate is used. Opiates are prescribed and are given by rectum (p. 60). Avertin or paraldehyde may be employed. Chloroform is administered (p. 447) to check the spasms, and this duty is frequently entrusted to the nurse, as she is usually the only one at hand when the spasm starts. Stimulants are not ordered until the spasms have ceased unless exhaustion is extreme.

Temperature, pulse, and respiration are taken every 4 hours. Just before death the temperature may rise to 108° F. or more, and is often found to be one or two degrees higher after death.

Nursing.—The patient is isolated and kept absolutely quiet in a darkened room; sudden light, movement, draught, or noise may produce a spasm, hence very much depends on the nursing. Everything must be done quietly and gently; it is unpardonable to let anything fall, or a door bang, so great is the suffering produced by noise. Coal should be in convenient-size lumps, wrapped in paper before being put in the scuttle and brought to the sick-room. Everything brought into contact with the patient needs to be warm; if the nurse has cold hands she should warm them in hot water before handling the patient. The patient must not be left alone for one instant until the surgeon pronounces him fit to be left.

Next to preserving perfect peace in the sick-room, feeding is the most important. This can seldom be done by mouth without producing a spasm, therefore rectal feeding (p. 58) will have to be resorted to; if this produces a spasm, nasal feeding (p. 55) under an anaesthetic will probably be ordered. If no spasms are produced, rectal saline infusion may be ordered every 4 or 6 hours, in order to relieve thirst and assist in the elimination of toxins. When the patient is able to take food by mouth, the diet must be fluid and nourishing, milk, egg-flip (p. 816), albumin water, glucose, etc., and later, when the spasms cease, the diet is increased to light, soft, nourishing, and easily digested food. During convalescence the patient is given a liberal diet. The bowels are kept open by simple enemata if necessary. The amount of urine passed must be carefully noted and a daily specimen tested for albumin (p. 35). If retention is present, fomentations over the bladder may be tried; if this fails, catheterization will probably be necessary (for catheterization see p. 66).

The *complications* are: Collapse (p. 562), exhaustion.

3. **Hydrophobia, or Rabies.**—*Cause.*—Infection introduced into the system by the saliva of a rabid animal, usually a dog, who snaps and bites at any one that it meets. This disease is now extinct in the British Isles. A very strict quarantine of six months is compulsory for all dogs entering the country, to prevent reintroduction of the disease.

Symptoms.—The symptoms include: Irritation about the wound, digestive troubles, mental depression, with dread of water (hence the name) followed in a few days by great excitement with muscular spasm. Death usually occurs in from four to seven days, either from paralysis (p. 361) or exhaustion. The symptoms may not appear for many weeks or months after the bite.

Treatment.—Antitoxin and vaccine treatment is given. The treatment as regards the nursing is much the same as that given under tetanus, special care being taken that the patient does not bite the nurse.

4. **Anthrax.**—*Cause.*—Infection by a micro-organism, the Bacillus anthracis. Transmitted to man by handling hides, wool, hair, and bristles from infected animals. There are two forms of the disease: anthrax proper, also called murrain; carbuncles.

Symptoms.—(1) *The external form.*—A few days, or sooner, after the infection, a red inflamed swelling (malignant pustule) appears, which rapidly increases in size; upon the centre appears a bleb of pus, which bursts, leaving a black scab about the size of a sixpenny piece. There is fever and great prostration.

(2) *The internal form.*—When the spores (p. 825) have been drawn into the lungs, the resulting form of anthrax is known as wool-sorter's disease, and there is usually septic pneumonia with haemorrhage (p. 259). When the spores have been swallowed,

ulceration of the stomach and intestines results, also excessive inflammation of the spleen which may terminate in gangrene (p. 573).

Treatment is by immediate administration of the specific anti-anthrax serum.—*External form.*—The pustule is excised and cauterized, and the use of strong antiseptics is prescribed (see carbuncle, p. 464). The weakness is treated by nourishing food, stimulants, oxygen, fresh air, and complete rest. Aperients are given to eliminate the toxins, drugs may be prescribed for the relief of pain.

Internal form.—All that can be done in these cases is to stimulate vital powers, support the general strength, and to relieve symptoms as they arise (see nursing, p. 212).

All cases of anthrax must be treated as highly infectious, and everything that comes into contact with the patient must either be destroyed by burning after use, or be subjected to a most rigorous disinfection (p. 47), these spores being most difficult to destroy. (For the nursing and treatment of infectious diseases see p. 316.)

5. **Actinomycosis.**—*Cause.*—Presence of the ray-fungus.

Symptoms.—The disease may be external, when a fungating growth is produced, or internal, the lungs and the intestines being most commonly attacked. Treatment is similar to that given for anthrax.

CHAPTER XVIII

THE NURSING OF CHILDREN

Qualifications of the Children's Nurse.—In addition to the nursing qualifications already mentioned in previous chapters, the following points are especially needful in a nurse undertaking the nursing of sick children:

Love of children: without this a nurse can never really understand and gain the confidence of the child, which is of the utmost importance. The nurse should be bright, cheerful, and merry, yet sympathetic and tender, observant, firm, but kind. Children take to a nurse more quickly as a rule if she is short and plump. Discipline is most important, a child soon learns whether or not it is necessary to obey; the unsuccessful nurse is the one who cannot get the child to obey and love her. Observation must be highly trained, as with infants and small children the nurse has to rely almost entirely on her observation as regards the child's need, and the appearance of objective symptoms (p. 183). The nurse should be able to enter into the child's games and thoughts, and remember that even a sick child requires to be taught the difference between right and wrong, and needs someone who will take an interest in all its joys or troubles. The child should be taught that no always means no, and yes, yes, never allowing it to do something which has just been forbidden, as otherwise it is impossible for the child to learn that the nurse means what she says. Bad habits are rapidly formed in childhood both during health and sickness, it is the nurse's place to prevent or check them when present.

OBSERVATIONS OF SYMPTOMS

Those given in Chapter V under objective symptoms, and in addition the following require mention:

Typical Cries.—Crying is the only way the infant has of announcing that it has a pain, or does not feel well, or is hungry, or requires attention. The cries of children vary in tone and quality according to the reason for the cry, and the nurse must be able to distinguish between them; this cannot be taught by books, it is necessary to experience the different cries, to listen attentively, and so learn the difference in the type. The following description may be found helpful:

Cry of hunger.—A hearty loud cry which continues until the child is fed. The hands are closed. Tears are present.

Cry of anger.—Loud violent screaming, the child works its arms and legs. Tears are often absent.

Cry of abdominal pain.—Sharp paroxysmal screaming which subsides as the pain becomes less, then occurs again with next attack of pain. The knees are drawn up, and the face has an expression of pain. The child appears exhausted after the attack.

Cry of brain disease (cephalic).—Loud shrill screams occurring at intervals, the child appears semi-conscious only, or may be unconscious.

Cry of pain.—A fretful whine, not vigorous, but fairly continual. If the child is in an exhausted condition it may not cry at all (p. 701), or the cry may be only a feeble whimper.

A healthy child should cry a certain amount during the day; this is necessary and good for it, as exercise, provided it is in moderation and for some ordinary cause, such as hunger, discomfort, anger, etc. A child who does not cry at all is usually in a serious condition and requires medical advice. Prolonged paroxysms of screaming should always be checked by removing or relieving the cause if possible, otherwise the child may scream until a convulsion occurs.

Convulsions are attacks in which the child becomes cyanosed (p. 362); its eyes are fixed and staring, consciousness is lost, the limbs stiffen, then the face, limbs, and body twitch irregularly, nystagmus (p. 209) may be present, also a squint, the fontanelle bulges and cyanosis increases. Gradually the twitching and rigidity subside, consciousness is regained, and the child lies pale and exhausted. Infantile convulsions are a symptom occurring in connection with some diseases or due to some conditions such as constipation, indigestion, teething, etc.

Treatment.—Loosen the clothing, give plenty of fresh air, and apply cold to the head. This is sufficient in mild attacks; when the attacks are more severe, the child should be immersed in a bath (temperature 100°–105° F.) for 5 minutes, a cold compress being applied to the head. In more severe cases bromide and chloral may be ordered by the physician to be administered by the rectum (p. 60) or morphia hypodermically (p. 84); or should these fail, inhalations of chloroform may be necessary. The cause will require to be treated, the bowels should be kept relaxed. After the attack the child must be kept quiet and strict attention paid to diet in order to prevent a recurrence. In very severe cases the convulsions may be almost continuous, one occurring as soon as the preceding one subsides; these cases are frequently fatal.

Flatulence (p. 209) is commonly caused by allowing the child to take the food too quickly, or, in a bottle-fed baby, it may be caused by the child sucking in air if the bottle is not held properly in position. It may also be caused by unsuitable food, or too large a quantity.

Symptoms.—The child has an abdominal cry, the legs are drawn up, the arms work and the child 'makes faces.'

Treatment.—Alter the child's position: lay him on his face if possible and gently pat him, or turn him on to his left side and gently massage the stomach from right to left, or he may be supported in an upright position for a few minutes. A teaspoonful of either hot water, dill water, or weak peppermint water may be given. When the 'wind' is brought up the child stops crying and usually sleeps.

Colic.—This may be caused by flatulence, constipation (p. 186), or undigested food in the intestine.

Symptoms are those already described under flatulence, except that they are more severe and prolonged.

Treatment.—When due to flatulence the treatment is that already described. For constipation an enema (p. 60) should be given and then an aperient, either castor or olive oil, the bowels being carefully regulated subsequently. If due to undigested food an enema is given followed by a dose of castor oil and subsequent careful dieting. Hot fomentations (p. 90) may be applied to the abdomen until relief is obtained. If the child becomes exhausted from repeated attacks, a few drops of brandy diluted with hot water, according to the child's age, may be given. Medical advice should be sought if the attack does not improve after the bowels have been opened, or if the attack is severe or prolonged.

General Nursing

Fresh air, sunlight, warmth, cleanliness, good and suitable food, suitable clothing and a regular life are the essentials in the rearing of a sick or healthy infant or child.

The *temperature* of the nursery should be 60° F., also in most cases of illness, with the exception of diseases of the larynx and chest when it may be necessary to maintain a higher temperature. Ventilation must be continuous and efficient (see Chapter I, p. 5). *Food* should be administered at regular intervals and at the same time each day. *Sleep* must be plentiful and the child should be put to sleep at the same time every day. Infants during the first three months sleep the greater part of the 24 hours, from three months to two years old they should sleep during part of the morning and afternoon in addition to the night; from two to six years old they should have a nap once during the day either before or after dinner and should have 12 hours' sleep at night; from seven to thirteen they require 12–10 hours' sleep, and after this 8–10 hours. No definite rule can be laid down, as some children require more sleep than others, but in no case should the child be prevented from sleeping if desired.

Bathing.—An infant should have a bath once a day; after the first month, if a strong healthy child, a bath night and morning may be given (see infant bathing, p. 698). Children should have a daily bath, preferably at night.

Infant diaper 'changing.'—This duty should be performed regularly at stated times, and in addition whenever the child is seen to require attention (for method of changing an infant's diaper see p. 700). The infant should be attended to before feeding; and directly after feeding the child should be held over a small chamber for a few minutes, since urine is generally passed after feeding. In this way the infant gradually becomes trained in control of the bladder. In addition the child should be inspected every 2 hours and the diaper changed if necessary. In some illnesses in which diarrhoea is present it is obligatory to inspect the child every half-hour at least, otherwise the correct number of stools cannot be reported and the infant's buttocks become excoriated from remaining in contact with the irritating excretions.

Temperature.—(For descriptions of temperatures and method of taking see p. 192.) When taking infants' and children's temperature, pulse, and respiration they should be observed in the following order: (1) count the respirations (p. 205) without touching or disturbing the child; (2) take the pulse (p. 200), not disturbing the infant; (3) take the temperature (p. 192). After taking the respiration and pulse, the child is attended to if necessary and the thermometer inserted in the rectum (p. 192), after which the child is left clean and comfortable. Otherwise if the child is disturbed in order to insert the thermometer, the pulse and respiration rate will be increased and therefore not accurately reported; this is important and often overlooked.

In older children, the temperature may be taken in the mouth, axilla, or groin according to the wishes of the physician. Young children should never be left with a thermometer; the nurse should hold it in position.

When nursing sick children the nurse must be absolutely conscientious about carrying out the treatment ordered, as regards food, medicines, and applications. The child cannot complain or remind the nurse of forgotten duties and an unconscientious nurse may take advantage of this. Children are among the most satisfactory cases to deal with from a nursing point of view, as they respond quickly as a rule to treatment, and the benefit of efficient nursing is soon apparent. A child's condition changes much more quickly in sickness than an adult's both in getting worse and getting better, therefore constant vigilance is necessary. (For general nursing of medical cases see p. 212; for surgical nursing see p. 460.)

INFANT FEEDING

Breast Feeding.—This is the natural way of feeding the infant and undoubtedly the best under normal conditions of mother and child.

The infant should be fed every six hours during the first twenty-four hours, every four hours during the second day, and from the third day, every three hours during the day, missing one feed at night (see table, p. 592). The mother should be instructed to nurse the infant alternately from each breast and not to allow the child to sleep until the food has been taken. The nipples require care (p. 713).

In cases in which the mother is unable to suckle her infant or in which it is not advisable for her to do so, the child must be fed either by a wet nurse or artificially by feeding-bottle.

A wet nurse is in many cases the most satisfactory substitute for the mother's milk, but it is usually impossible to obtain a satisfactory person. She should be absolutely healthy, be from twenty to thirty years old, possess an equable temperament and a good character; the breasts should be well adapted for suckling, the milk plentiful and good, and her own child should be about the same age as the foster-child. The wet nurse must be kept under supervision, requires suitable food, exercise, abundant fresh air and sleep, no alcohol, and it is most important to ascertain that her bowels are regular.

Artificial Feeding.—The child is fed by means of an infant's feeding-bottle. Of these there are a great variety; the simplest and therefore the easiest to keep clean is the boat-shaped, or oblong, bottle, fitted with an Agrippa teat. The bottle and teat should be sterilized once a day by boiling. After use the bottle should be rinsed in cold water, washed in hot water with a bottle brush, then rinsed in cold water and left covered in a solution of boracic, or clean water containing soda bicarbonate. The teat requires thorough cleansing in the same way. Each infant should have its own teat and feeding-bottle.

While many authorities recommend as a routine measure the dilution of milk, according to definite scales, the celebrated French obstetrician, Budin, has shown that most children may be fed on undiluted cow's milk. The same care must be taken to keep to the feeding time-table accurately. The amounts given depend on the capacity of the stomach—the intervals, on the period required for the stomach to empty. The following table is given as a guide for *whole milk feeding*:

Age	Amount in 24 hours	Number of feeds	Interval	Amount per feed	
1st day					
				Milk	Milk sugar
1st week	4–14 ounces	7	3 hours	½–2 ounces,	½ teaspoonful
2nd week	17½ ounces	7	3 hours	2–2½ ounces,	½ teaspoonful
3rd week	18–19 ounces	6	4 hours	3 ounces,	½ teaspoonful
4th week	20 ounces	5	4 hours	4 ounces,	½ teaspoonful
4th–8th week	21–28 ounces	5	4 hours	4½–5½ ounces,	1 teaspoonful
3rd–4th month	30 ounces	5	4 hours	6 ounces,	1 teaspoonful
4th–5th month	32 ounces	5	4 hours	6½ ounces,	1 teaspoonful
5th month onwards	35 ounces	5	4 hours	7 ounces,	1 teaspoonful

N.B.—The infant should miss one meal at night as arranged in this table.

In some cases children have difficulty in digesting the curd, and for them the addition of one grain of sodium citrate to the ounce of milk, making the curd much finer, is very helpful.

The constipation from which bottle-fed children may suffer should not be treated with castor oil, which is a purgative, and the end effect of which is astringent, and therefore constipating. The addition of more sugar to the food will often relieve the constipation, or the use of a preparation of sugar and paraffin, such as Wander's maltose and paraffin, or virolax, taken in teaspoonful doses three times a day.

Dilution.—Occasionally children do not thrive on whole milk, even with the addition of sodium citrate and sugar. For them dilution may be required.

To feed a normal baby on diluted cow's milk.—The energy requirements of infants up to twelve months of age are estimated to be 50 calories per pound body weight.

Cow's milk is estimated to yield 20 *calories* per ounce.

Sugar is estimated to yield 120 *calories* per ounce.

To feed a normal baby from birth to 6 *months of age:*

Times of feeding until the infant weighs 10 lb.: 6 a.m., 9 a.m., 12 noon, 3 p.m., 6 p.m., and 10 p.m.

After the infant weighs 10 lb.: 6 a.m., 10 a.m., 2 p.m., 6 p.m., 10 p.m.

Formula.—Boiled cow's milk, 1 pint; water, 10 oz.; brown Demerara sugar, 1½ oz. (3 level tablespoonfuls).

Infants'	weight	7	lb.	give	6	feeds of	3	oz.	as formula
,,	,,	8	,,	,,	6	,,	3¼	,,	,,
,,	,,	9	,,	,,	6	,,	3¾	,,	,,
,,	,,	10	,,	,,	5	,,	5	,,	,,
,,	,,	11	,,	,,	5	,,	5½	,,	,,
,,	,,	12	,,	,,	5	,,	6	,,	,,
,,	,,	13	,,	,,	5	,,	6½	,,	,,
,,	,,	14	,,	,,	5	,,	7	,,	,,
,,	,,	15	,,	,,	5	,,	7	,,	,,

No feeds should be given at night, but drinks of water may be given if the baby wakes in between feeds.

In addition to above formula give *orange juice, two* to *three teaspoonfuls* daily, diluted with water and sweetened with sugar. From about nine weeks old the infant should have one to two teaspoonfuls of cod-liver oil daily, except in hot weather.

The caloric value of the above can easily be checked; for example: Infant weighing 12 lb. requires approximately 600 calories and receives, according to formula, milk 20 oz., water 10 oz., sugar 1½ oz.

Milk 20 oz. × 20 (20 cal. yielded by 1 oz.)	400 calories
Sugar 1½ oz. × 120 (120 cal. yielded by 1 oz.)	180 calories
	580 calories.

The twenty calories short do not matter, they can be made up by the sugar added to the orange juice.

Average daily diet from six to nine months of age. Weight 15–18 lb.:

6 a.m.	Milk 5 oz. Water 2 oz. Sugar 1 heaped teaspoonful.
10 a.m.	The mixture as above with the addition of one heaped teaspoonful of a cereal, e.g. Robinson's patent groats or barley.
2 p.m.	Milk 5 oz. Sugar 1 heaped teaspoonful. To this add 2 teaspoonfuls of bone and vegetable broth.
6 p.m.	As at 10 a.m., but use a different cereal, e.g. Chapman's entire wheat food.
10 p.m.	As at 6 a.m.

Fruit juice two to three teaspoonfuls, orange or tomato diluted and sweetened, and to *protect* against rickets, a teaspoonful of cod-liver oil emulsion, or a few drops of halibut-liver oil, should be given immediately before three of the feeds, except in very hot weather.

Note.—All milk should be brought to the boil. The cereals should be cooked, directly for twenty minutes, or from half to one hour in a double saucepan.

From nine months to one year of age. Weight 18–22 lb.:

The transition from the previous diet to this should be gradual.

On waking.	One tablespoonful of orange, tomato, or grape-fruit juice sweetened and diluted. One rusk.
8 a.m.	The child should be spoon-fed with half a cup of cereal, e.g. cream of wheat, groats, etc., or given half a rusk or Robb's biscuit with milk (8 oz. of milk, including that given with the cereal). Four mornings in the week give half an egg, and two mornings, toast crumbs or crisp bread fried in bacon fat or chicken dripping.
12.30 p.m.	(1) One tablespoonful of mashed potato and a tablespoonful of sieved vegetables moistened with four tablespoonfuls of broth. As the child approaches one year of age the following may be added: pounded chicken, sole, plaice, brains, or underdone scraped steak. (2) One tablespoonful of sago, semolina, cream of rice, or tapioca with sugar, jelly or apple sauce with 4 oz. of milk. Water to drink.
4.30–5 p.m.	Milk 8 oz., rusk and milk, or Robb's biscuit and milk. Thin brown or white bread and butter. Junket or custard, stewed fruit.
10 p.m.	Four oz. of milk if the child is awake. This feed should be discontinued between nine and ten months of age.

To protect against rickets and bad teeth, a teaspoonful of cod-liver oil emulsion, or cod-liver oil and malt, or a few drops of halibut-liver oil, should be given three times daily except in very warm weather.

DENTITION

Many infants cut their teeth without any troubles, with others many complications may be present. Infants are occasionally born with one or more teeth.

ORDER OF DENTITION

Milk teeth	Age
2 Lower central incisors	6–9 months
2 Upper central incisors 2 Upper lateral incisors	8–10 months
2 Lower lateral incisors 4 First upper and lower molars	15–21 months
4 Canines	16–20 months
4 Second upper and lower molars	20–24 months

The appearance of milk teeth is very irregular. The first tooth is usually cut between the fourth and eight month. At the end of twelve months, eight teeth should be present; twenty teeth being present at the end of the second year.

Complications.—Sleeplessness, loss of appetite, pyrexia (p. 196), convulsions (p. 588), bronchitis (p. 248), and diarrhoea (p. 186).

ORDER OF SECOND DENTITION

Permanent teeth	Age
First molars (six-year-old molars)	6 years
Central incisors	7 years
Lateral incisors	8 years
First bicuspid	9 years
Second bicuspid	10 years
Canine	11 years
Second molars (twelve-year-old molars)	12 years
Wisdom teeth	

The order of second dentition is subject to much variation, it begins frequently with the central incisors before the first molars. As a rule it proceeds straightforwardly without any constitutional disturbance.

COMMON DISEASES OF INFANCY

The majority of diseases to which children are subject occur also in adults; these have already been described under the various headings in preceding chapters. Other diseases and conditions occurring most commonly in children are as follows:

1. **Enuresis.**—A condition of incontinence of urine. This occurs in children of either sex, and most commonly in children of a nervous temperament. It may be due either to a delay in acquiring control of the bladder, or be acquired and caused by either an

acute illness, polyuria (p. 243), shock, fright, or from bad habits, omitting to empty the bladder as often as necessary.

Treatment.—The child must be taught to empty the bladder as often as necessary, and at night he should be wakened once or twice until control has been established. The child should not be punished for this condition unless it is definitely proved to be due to laziness. Drugs for this condition are belladonna and ergot, but these are not given unless under medical advice and supervision. The fluid given to drink should be restricted during the latter part of the day, especially at the last meal. No tea or coffee should be allowed at any time. The last meal should be light and digestible. The child should be encouraged to lie on the side during sleep, and should lead a healthy outdoor life, worry, strain, and excitement should be avoided; it may be necessary to omit lessons or to restrict them for a time. He should be guarded from ridicule, and for this reason boarding school is not advisable until the condition is cured.

2. **Masturbation.**—A morbid habit consisting in manipulation of the external genital organs, occurring in children of either sex, which may start in infancy, but more commonly occurs in older children about the school age. In girls, the habit may be started by some local irritation, and has commenced as a mere scratching or rubbing of the parts to palliate itching or discomfort.

Treatment.—The habit must be checked as soon as noticed, the child should be carefully watched to prevent concealment. Any irritation is treated; a warm bath should be given twice a day. A judicious bribery is often useful, the child being allowed some treat if the habit is given up for a certain length of time. Some restraint or punishment may be necessary if the habit persists, but the latter only causes deceitfulness, and the habit continues. The child should lead a healthy outdoor life with plenty of interests to occupy its mind, and be sufficiently tired at bedtime to want to sleep immediately. Medical advice should be obtained if the habit continues, bromide or belladonna may be prescribed.

3. **Pica, or Perverted Appetite** (p. 210).—A habit in which the child eats mud, mortar, coal, cinders, hair, paper, gravel, etc. It occurs commonly during the second year of life, and quite apart from the condition which accompanies mental deficiency.

Treatment.—Prevent the child from obtaining the desired substance. The general health should be improved, and the child live a healthy outdoor life. Suitable food with the necessary vitamin content (p. 784) is given. Any symptom of indigestion or constipation should be remedied.

4. **Constipation.**—May be relieved in infants by introducing a small soap suppository (p. 63) into the rectum. The child should

have at least one action of the bowels daily, very commonly two are normal. Castor oil should not be given as a regular aperient, but is useful when it is necessary to clear out the bowels before starting other treatment; it tends to constipate after its aperient action is over. Drugs suitable for infants who are habitually constipated are manna, olive oil, milk of magnesia, liquid paraffin. The substitution of brown sugar for white sugar or a little additional cream in the food will suffice in mild cases, but caution is required so that the quality of the food is not greatly altered, or indigestion will be added to constipation; except in the mild cases it is better to give magnesia or manna. For older children, syrup of senna, liquorice powder, paraffin, and senna pods are all useful and harmless aperients. The child's diet should also contain fruit and vegetables in moderation but not in excess, as children are easily upset by fruit and vegetables; plenty of water should be given to drink. The training of children in regular habits is most important to prevent, and also when curing, constipation. Children and infants from their earliest days should be taught and encouraged to have an action of the bowels at the same time daily, preferably after breakfast. All persons having the care of children whether sick or healthy should make it their duty to see that the child has a regular time and opportunity and takes advantage of it to attend to this matter, as it is absolutely essential to the child's health both at the time and later in life.

5. **Infantile Diarrhoea** (**Gastro-Intestinal Catarrh**).—*Causes.*—Improper food, cold.

Symptoms.—Colic, the infant cries fretfully, the knees are drawn up, there may be vomiting at this stage, later diarrhoea. The bowels are opened six or seven times during the day, the stools are loose, yellow at first then greenish and slimy, containing undigested food (for description of stools see p. 186). The anus and buttocks become reddened and excoriated. The temperature is often raised to 101°–102° F. for a few hours, but soon drops to normal.

Treatment.—Remove the irritating cause by a dose of castor oil, apply warmth to the abdomen, restrict the diet to albumin water (p. 816) or boiled water. The attack passes off quickly when the bowels have been emptied of the irritating substance. Care is needed in feeding for some time subsequently, the food should be altered to suit the child's digestion.

6. **Cholera Infantum** (**Summer Diarrhoea**).—Acute and subacute. An infective disease with a high mortality.

Cause.—Contaminated milk. Flies have been found to be the most common means of contamination.

(*a*) **Subacute.**—*Symptoms.*—Sudden onset; the infant vomits, passes a few loose stools which are green and slimy at first, later watery, of a dark-brownish colour, and extremely offensive. The stools may number ten or twelve a day. Vomiting varies, sometimes two or three times a day, in other cases much more frequently. The appearance of the infant is altered much more rapidly by vomiting than by the diarrhoea. The eyes become sunken; the face pinched; the fontanelle is depressed; the limbs lose their firmness; the tongue is at first furred, later unnaturally clean and red. The temperature is often raised for the first few days, then becomes normal or subnormal. In most cases the vomiting ceases after a few days, the diarrhoea continuing, and after fluctuating for a few weeks may slowly subside, or in other cases it becomes worse, the temperature rises to 104° F. or more, vomiting reappears, and death results.

Treatment.—In the early stage the bowel is emptied by means of a dose of castor oil, later small doses of castor oil are given three times a day; this has a constipating effect. Brandy is given unless the case is a mild one. Ten drops in a teaspoonful of cold boiled water may be given to an infant under six months, or 20 drops if over six months; this may be repeated every 4 or 2 hours until 4 doses have been given, but if continued after this, smaller doses should be given, 5 minims for an infant under three months, 10–15 minims for an older infant.

Diet.—Albumin water (p. 817) or plain boiled water may be given until the vomiting is less severe, later rice water, barley water, whey, white wine whey, broth, after which milk suitably diluted is ordered. (For preparation of foods see Chap. XXVIII.)

Nursing.—Collapse is treated by immersion in a hot mustard bath (p. 117) for 5 minutes, the child is then quickly dried with hot towels, dressed in flannel, and placed in a warm cot, with hot blankets next to it, and hot bottles carefully protected placed at a suitable distance around (see hot bottles and electric thermal pad, p. 29). Subcutaneous infusion of saline (p. 82) is usually prescribed, and may be repeated every 4 or 6 hours if required. The child should be inspected every ½ hour to see if an action of the bowels has taken place during the acute stage, otherwise it is impossible to give an accurate report of the number of stools if left until the baby is attended to in the usual way; one or more actions may have taken place (p. 590). The buttocks need extreme care, the skin very soon becomes excoriated; to prevent this, the child should have the diaper changed immediately an action of the bowels takes place, the skin should be washed with clean warm water, carefully dried with a soft towel, then rubbed with simple ointment. Should the skin become excoriated, a small square of old linen which has

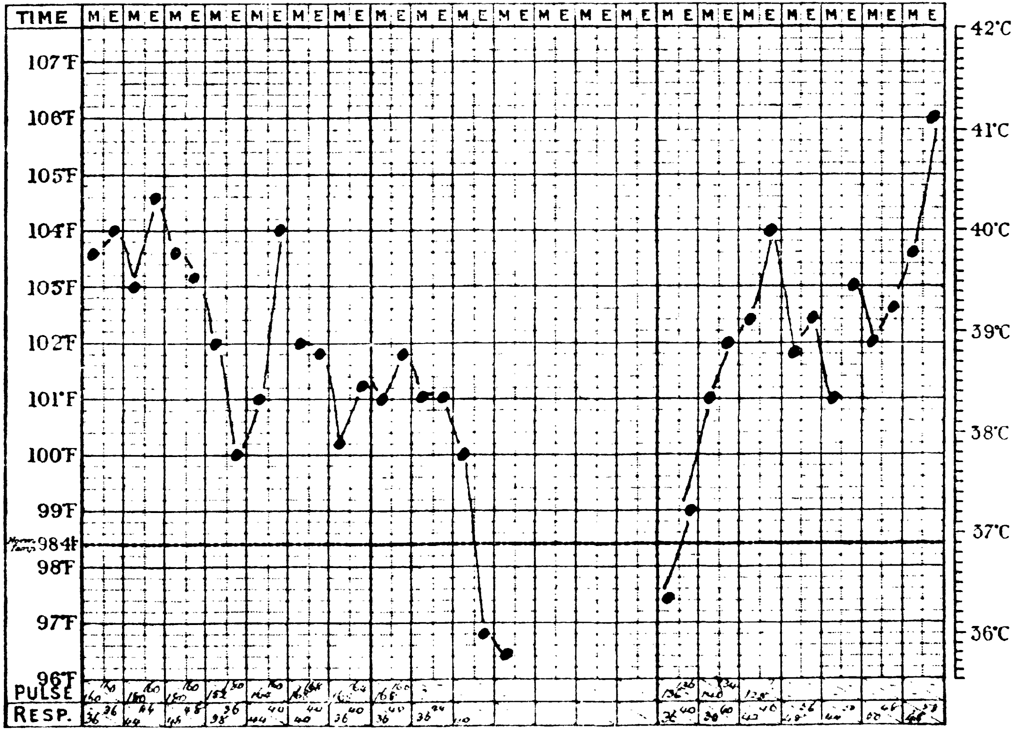


FIG. 214. Temperature chart of two cases of cholera infantum showing two types.

been boiled and dried should be spread with vaseline, or Lassar's paste, and applied before the clean diaper. All folds of skin should be carefully separated, washed, dried, and powdered each time the infant is attended.

(*b*) **Acute.**—*Symptoms.*—This is the more rare condition and is often rapidly fatal; the child may die within a few hours from the onset. The onset is sudden; the face becomes grey; the nostrils pinched; the eyes are sunken with a dull vacant expression; the fontanelle is deeply depressed; the tongue is dry and brown, the extremities cold and blue; the skin is dry and loose over the sunken abdomen; the infant lies in apathy, or flings its arms restlessly from side to side as it licks its lips from thirst; there may be complete absence of sleep with coma-vigil (p. 361), which is almost always a fatal sign. Vomiting is constant and severe, even teaspoonfuls of water not being retained. The stools are at first loose and yellow, they quickly become liquid with a characteristic rice-water appearance. The temperature is commonly subnormal, but in some cases may be 105° or 106° F.; the respiration is rapid and panting; the pulse becomes extremely rapid, then imperceptible at the wrist (see chart, Fig. 214). Exhaustion increases rapidly, and the child may die within a few hours or days.

Treatment.—A hypodermic injection of strychnine is prescribed, followed by a hot mustard bath (p. 117) for the collapse, also saline, given either subcutaneously (p. 82) or intravenously (p. 74), and the rectum is washed out with saline solution (p. 61). Stomach lavage (p. 64) may also be ordered. Brandy is given by the mouth, or if it is not retained it may be ordered hypodermically. Warmth is absolutely essential, and for this reason the mustard bath is the most efficient treatment as a preliminary, as it improves the circulation, and thus warms the child more quickly than any other means. After the bath, the child is wrapped in hot blankets and surrounded with hot bottles or electric thermal pad, or radiant-heat cradle as described above. The same care is needed in the care of the buttocks to prevent excoriation, and the child needs constant inspection so that an accurate report may be made of the number of stools.

Diet.—Milk is forbidden during the acute stage. Boiled water with glucose, brandy and water, or albumin water only are allowed during this stage; later, white wine whey (p. 816), or broth is prescribed, and finally milk in small quantities and well diluted. Great care must be taken in the preparation of the food, also in the cleansing and sterilizing (p. 42) of all articles used in the preparation and administration of the food. The infant's mouth is cleansed before and after each feed and during the interval if necessary.

The jugs, etc., containing the food must be closely covered with clean muslin covers.

Nursing.—Irrigation of the colon is usually ordered every 4 hours, either sterilized warm water saline or boracic being used. Stomach lavage is also ordered twice a day or oftener, warm water being used. (For method of administering rectal injections see p. 61; stomach lavage, see p. 64.) The hypodermic injections of strychnine are continued as a rule until the child is convalescent. Ether may be ordered to be given hypodermically in cases of extreme collapse which do not respond to strychnine. Intestinal bacteriophage given by mouth is often of great value. Other drugs prescribed include opium, small doses of castor oil, bismuth, and silver nitrate.

Complications.—Thrush (p. 215); bronchitis (p. 248); bronchopneumonia (p. 251); otitis media (p. 656); cerebral symptoms (p. 379); convulsions (p. 588); oedema of the extremities (p. 190); purpura (p. 286).

7. **Infantile Marasmus (Wasting).**—This condition is really a symptom occurring in connection with other diseases or abnormal conditions.

Causes.—Improper food, especially incorrect dilution of cow's milk; or excess of cream and sugar, or too large a quantity; lack of power of assimilation; acute intestinal disturbance; congenital syphilis (p. 605); chronic constipation (p. 596); congenital heart disease (p. 606); chronic pyelitis (p. 240); and rarely, tuberculosis (p. 318).

Symptoms.—The child loses weight slowly at first, then rapidly; becomes feeble and listless, and may be very fretful or particularly quiet.

Treatment consists in removal of the cause and the administration of suitable food; there is no rule as to this, each child being fed on the quantity and kind of food which it is able to assimilate, and which prevents loss of weight and subsequently increases weight. Extract of malt is useful in some cases, also rubbing the child over with oil daily (see inunction, p. 97). Warmth, cleanliness, and fresh air are most important.

Complications.—Thrush (p. 215), boils (p. 413), otitis media (p. 656), oedema (p. 190), purpura (p. 286), collapse (p. 562).

8. **Rickets.**—A disease of infants, children, and adolescents, marked by curving of the long bones, with enlargement at the ends, bending of the ribs, and deformity of the skull.

Cause.—Error in diet, chiefly insufficient fat, or excess of starch, or both, insufficient calcium, and vitamin D deficiency. (See vitamin tables, pp. 785, 786.)

Symptoms.—Fretfulness at the onset, disturbed sleep, in which the child throws off the bedclothes and lies uncovered, sweating about the head during sleep, late dentition, bending of the ribs, epiphysial thickening of the ends of the long bones, especially the radius, large protuberant abdomen, late closure of the fontanelle, reluctance or inability to stand or walk, bandy legs, or knock-knees, large square head (hot-cross-bun head), stooping curve of the spine, tendency to convulsions, also catarrh of the respiratory and alimentary tracts, anaemia.

Treatment.—Food containing the necessary vitamins (p. 784) is of the utmost importance. If the child is a bottle-fed baby the food should consist of diluted cow's milk, but so diluted that the child obtains the right percentage of fat (p. 592), calcium, etc. Orange juice or strained tomato juice is a necessity. Cod-liver oil is found to be a most valuable drug, either plain or with malt. Phosphorus is also sometimes prescribed. Starchy foods must not be given in excess; a child of nine months may have one Robb's biscuit a day, at eleven months two starch-containing feeds may be given, one being milk pudding. The yolk of an egg lightly boiled may be given daily from the age of nine months. At twelve months bacon fat and breadcrumbs make a valuable food, and during the second year fish, chicken, gravy, veal broth, custard, etc., should be given, avoiding starchy foods in any quantity; milk should still form the greater part of the child's food. Sunlight, fresh air, and cleanliness are necessary; the child should be prevented from putting any weight on the limbs during the acute stage in order to prevent deformity; splints (p. 157) should be used if necessary, and the child kept in the recumbent position.

Complications.—Convulsions (p. 588), laryngismus stridulus (p. 604), anaemia (p. 283), catarrh of respiratory tract (p. 248), broncho-pneumonia (p. 254), scurvy.

9. **Infantile Scurvy.**—*Cause.*—Improper feeding most commonly occurs when patent foods are used either with or without fresh milk. It is a preventable disease, and in the early stages usually yields quickly to treatment.

Symptoms.—The onset is gradual; the child appears ailing, is pale, loses weight, cries when handled or moved, and lies absolutely still. The legs are most commonly affected. If teeth are present, the gums around them are swollen and purple, and bleed easily when touched. The urine may be smoky or red with blood (see haematuria, p. 237). Swelling and bruises may be present on parts subjected to pressure, oedema (p. 190) may also be present over the thickened part of the limbs. Haemorrhages may occur under the skin (p. 189), into the mucous membrane of the hard palate; into the orbit, causing a black eye; from the kidney, producing haematuria; visceral and mucous membrane haemorrhages may also occur, also haemorrhage into the joints. The temperature is usually subnormal, although in many cases there is pyrexia (p. 196).

Treatment.—In order to prevent scurvy, children fed on patent foods should have either raw meat juice (p. 819) or red gravy daily, 1 to 4 tablespoonfuls in the 24 hours according to age. Fruit juice should also be given, either orange or grape juice.

When scurvy is present, potato is specially valuable; it is prepared as follows: Boil or steam a potato so that it is floury, scrape off the outside floury portion, take 2 heaped teaspoonfuls and beat thoroughly with 1 ounce of milk until a smooth thick cream is made. One and a half to 2 teaspoonfuls of this potato cream are given 3 or 4 times daily, after 2 or 3 weeks the dose is gradually reduced and omitted altogether after 4 weeks' treatment. The potato cream may be given either separately or mixed with a portion of the food.

In addition 2 teaspoonfuls of raw meat juice are given three or four times in the 24 hours, also ½ teaspoonful of orange juice 2 or 3 times a day provided there is no diarrhoea; the orange juice should not be given in addition to the potato cream if there is any tendency to diarrhoea. The patent food is discontinued and the child is fed on milk diluted with water; the milk should be previously scalded. i.e. heated just to boiling point.

The child should be moved and handled as little as possible during the acute stage, as every movement causes intense pain. A loose garment should be worn which may be removed without turning or lifting the infant. The minimum amount of washing should be done during the painful stage, which does not usually last more than a few days.

Complications.—Diarrhoea (p. 221), exhaustion, pyelitis (p. 240), rickets (p. 601).

Banti's Disease.—(See p. 285.)

Still's Disease.—A type of rheumatoid arthritis occurring in children before the second dentition. The swelling is not due to changes in the bone, so there is no grating. The affected joints are painless. The swelling usually starts in the knee, wrists, and cervical spine. There may be pyrexia (p. 196), also enlargement of lymph glands and spleen.

Treatment is that given under rheumatoid arthritis (p. 311).

Laryngitis Stridulosa (Croup).—Occurs most commonly in children under ten years of age.

Cause.—Cold, over-eating; predisposing cause, nervous instability.

Symptoms.—The onset is sudden, with dyspnoea, accompanied by a loud brassy cough, with stridor on inspiration, the voice may be hoarse. As the attack proceeds the dyspnoea becomes more urgent, cyanosis is present, and the child fights for breath.

Treatment.—Attacks should be prevented as far as possible by avoiding the cause. The child should live a healthy life with plenty of nourishing and digestible food, and outdoor exercise.

Treatment during an attack.—Place the child in a steam tent (Fig. 50, p. 105); this may be improvised by using clothes-horses and sheets; a steam kettle may be made by adding a long brown paper funnel to an ordinary kettle (see p. 106). Apply hot fomentations (p. 90) over the larynx. Give ipecacuanha wine in drachm doses until vomiting is induced. Adrenalin chloride has been found to be most useful in these cases, as in attacks of asthma (p. 307); 1–2 drops in 1 teaspoonful of water are commonly prescribed to be given at the beginning of the attack. A mustard bath (p. 117) does good in some cases.

Drugs ordered between the attacks are: Arsenic, stramonium, iodide of potassium, cod-liver oil, and tonics.

Climate has great influence on these attacks; suitable places for children suffering from this complaint are Bognor Regis, Eastbourne, Penzance, and Worthing.

Other cases of stridor in children which may be mistaken for croup are: Laryngismus stridulus (see below), simple laryngitis (p. 669), diphtheria (p. 349), laryngeal spasm of the new born (p. 605), papilloma of the larynx (p. 604), foreign body (p. 526), and retropharyngeal abscess (p. 661).

Laryngismus Stridulus (Child Crowing).—This disease occurs most commonly in rickety children between the ages of six and eighteen months, and is limited to the first four years of life.

Symptoms.—The onset is sudden: the infant appears to hold its breath and becomes deeply cyanosed, then makes a peculiar noise like a whoop or crow, breathing is then resumed and the cyanosis disappears. Death may take place from suffocation during an attack. The attacks may occur several times during the day or night and without apparent cause. These children are specially liable to convulsions (p. 588) or tetany (p. 300).

Treatment during an attack.—Apply a hot sponge to the larynx and flick the chest with a towel wet with cold water.

General treatment consists in regulation of the bowels and careful dieting, foods rich in vitamins A, B, C (p. 784). Bromide and cod-liver oil emulsion is prescribed three times a day, and usually causes a rapid subsidence of the attacks.

Papilloma of the Larynx.—A comparatively rare disease which occurs more commonly in children than in adults.

Symptoms.—Sudden onset of dyspnoea accompanied with stridor (p. 205) and cyanosis (p. 188). The attack may subside after a few minutes, or continue with increasing severity until death results from suffocation unless immediate relief is given.

Treatment.—Surgical treatment is the only means of curing the complaint. Tracheotomy is performed (p. 662) and later the papillomata are removed by repeated operations extending usually over some months or years. When the larynx is cleared from the papillomata the child is taught to breathe without the tracheotomy tube. This is done gradually by corking the opening of the tube for a certain period each day, when the child has learnt to breathe naturally the tube is removed and the incision closed.

Laryngeal Spasm in the Newborn resembles laryngismus stridulus in the symptoms, but occurs in younger infants, and not in connection with rickets.

Cause.—Not known.

Treatment.—Respiration should be stimulated during an attack by flicking the chest with a cold wet towel, smelling salts may be applied to the nose, also amyl nitrite (capsules containing 1 minim). Death may occur during the attack.

Status Lymphaticus.—A condition characterized by an overgrowth of the lymphoid tissues of the body, especially in the pharynx, the tonsils, and the abdominal and mediastinal glands. The thymus gland, which normally decreases in size until at puberty it has almost disappeared, remains enlarged. The spleen and the bone marrow may also be affected. The condition is not usually discovered until after death. In suspected cases, treatment consists in avoidance of anything likely to cause shock, such as fright, sudden immersion in cold water, and illness. Anaesthetics frequently cause death in these cases; on the other hand, any operation performed without efficient anaesthesia may prove fatal from shock. Operations are not undertaken in recognized cases of this condition unless necessary to save life.

CONGENITAL DISEASES

Congenital Syphilis.—Syphilis is transmitted to the child through the mother. Research has proved that it is impossible to infect the ovum except through the mother, and, therefore, without syphilis of the mother there cannot be congenital syphilis of the child, although the mother may have the disease in such a mild form as to show no symptoms beyond a positive Wassermann reaction. (For syphilis see p. 322.)

Symptoms.—The majority of cases are born with a healthy appearance. Within the first few weeks after birth the infant shows signs of ill-health, and wastes (marasmus, p. 601). The skin becomes shrivelled and of a muddy-brown colour. The child has an old-man appearance, and is often wakeful at night. It snuffles at the nose from nasal inflammation, which may extend to the bones, causing permanent flattening of the bridge of the nose (a common sign of hereditary syphilis). Skin rashes (p. 188) appear. These affect the whole body, but show a special predilection for the soles and palms, the genitals and the anus. The rashes are of a brownish-coppery tint, and take the form of papules (p. 189), pustules, blebs, or larger plaques. Later signs such as condylomata (p. 323), especially around the anus, changes in the bones, leading to swellings at the joints or in the shafts of the long bones. The bones of the skull sometimes become thin (craniotabes).

The above are the chief signs in the infant. When the child is older (from five to fifteen years) other signs appear. (1) The permanent incisors become notched at the edges and peg shaped (Hutchinsonian teeth); (2) ulcers (p. 573) and fissures (p. 189) appear about the corners of the mouth; (3) the eyes may be affected either with interstitial keratitis (p. 634), or choroiditis (p. 635); (4) synovitis of the knees, also periostitis (p. 323) of the bones may occur; also other lesions met with in the acquired form (see p. 322).

Treatment.—Mercury, quinine iodobismuthate, and arsenic may be ordered by mouth. Mercurial inunction (p. 97) is also prescribed. Intravenous injections of Novarsenobillon (Salvarsan) are another form of treatment which is claimed to effect a cure more quickly. Potassium iodide is prescribed in the later stages. Fresh air, good food, and hygienic surroundings are important. Congenital syphilis is curable, but the treatment needs to be carried out conscientiously over a prolonged period, several years. Syphilis in children is a much more fatal disease than in the adult, and for this reason the symptoms should be recognized at once and medical advice sought, in order that the child may have suitable treatment prescribed. The disease must be regarded as contagious (p. 317). The child should not be kissed by others. Separate washing flannels, towels, napkins, toilet crockery, etc., should be used. Spoons, bottles, comforters, etc., should be kept apart and sterilized after use. After attending to the child the hands should be carefully washed and disinfected (p. 431).

Congenital Heart Disease includes all congenital abnormalities of the heart, of which there are many kinds. Most of these conditions are abnormalities of development; and therefore, strictly speaking, are not diseases in the ordinary sense of the word. Common malformations are: bilocular heart, absence of a septum; trilocular heart, absence of either a ventricular or auricular septum (in both these conditions life cannot be maintained for long); incomplete development of a septum, allowing the blood on both sides to mix. Congenital heart disease is often accompanied by other malformations or faulty development.

Symptoms.—These vary according to the condition, the most common and evident being: Cyanosis (p. 188) which may vary from a slight blueness to a deep leaden colour, or it may be entirely absent in some conditions; clubbing of the fingers (p. 412), dyspnoea (p. 205), wasting (p. 601), the skin appears thin, transparent, and glossy, the hair is remarkably fine, soft, and silky. Oedema may be present in the dependent parts (p. 190).

Treatment.—The child is most carefully protected from cold and chills, these very frequently end fatally. The general health is attended to, constipation (p. 596) must be avoided. The child should be carefully watched to prevent undue exertion or excitement, and shielded from frights and shocks of any kind. Drugs are sometimes prescribed to assist the heart. When the heart shows symptoms of failing compensation (p. 269) the treatment is that already described under heart disease (p. 269). Very few of these cases live to adult life, but with care many children live comfortably for years.

Complications.—Pneumonia (p. 251), bronchitis (p. 248), bronchopneumonia (p. 254), marasmus (p. 601), kidney disease (p. 241).

Laryngeal Stridor.—*Cause.*—Congenital malformation of the larynx.

Symptoms.—Stridor (p. 205), the noise occurs with each inspiration and resembles a 'clucking,' 'quacking,' 'croaking,' or 'crowing' noise. The stridor persists during sleep in some cases. The cry is normal. There is no dyspnoea (p. 205), distress, or cyanosis (p. 188), but the ribs may be retracted during inspiration.

Treatment.—Avoidance of cold or anything likely to produce chest complications is necessary. The stridor usually becomes less after the second or third year and gradually disappears as the opening of the larynx becomes larger.

Imbecility.—A condition usually due to faulty development, it may also occur after a blow or fall.

Treatment.—The child should be educated as far as is possible; the majority of patients can be taught to be clean, others may walk and talk, and some may learn to do easy work (see mental diseases, p.400). Many of these cases are complicated by paralysis (p. 361) or fits (p. 362).

Hirschsprung's Disease, or congenital hypertrophic dilatation of the colon, also known as *idiopathic dilatation of colon*, and *megacolon*, is found in children and young adults, usually males. The sigmoid, or entire colon is enormously dilated and may fill the entire abdomen.

Symptoms.—Constipation, pain, progressive distension of the abdomen, diarrhoea producing temporary reduction of the abdomen, dyspnoea, and palpitation from pressure on the diaphragm.

Treatment.—Abdominal massage (p. 745), enemata, liquid paraffin, and aperients. Sympathetic ganglionectomy, an operation on the sympathetic nerve supply of the colon (p. 491) may be performed.

Little's Disease, or congenital muscular rigidity; spastic paralysis of infancy.

Cause.—Injury to the brain during birth, or faulty development of the nervous system.

Symptoms.—The paralysis is spastic (see glossary), and may be either monoplegia, hemiplegia, diplegia, or quadriplegia, according to the number of limbs involved. There is often mental deficiency.

Treatment is mainly palliative. It is concerned in the correction of deformity, particularly of the legs, by manipulation and tenotomy, followed by education in muscle control.

CONGENITAL MALFORMATIONS

Deformities and also malformations occurring as a result of faulty or incomplete development are included under this heading.

Transposition of Viscera.—A condition in which one or more or all the organs are placed on the opposite side of the body. The condition may not be discovered until late in life and may cause no inconvenience.

Hermaphroditism.—A condition in which the generative organs are partly male and partly female, or not entirely male or female. The doctor should be consulted as to whether the child should be brought up as a boy or a girl.

Deaf-Mutism.—A condition in which the child is totally unable to hear sounds, and as a result the child is dumb. The condition is incurable, but the child may be taught to lip-read and also to talk quite distinctly if the ' deaf and dumb ' education is started early in life, and provided the child is normal in other ways.

Blindness.—Many congenital forms of blindness are incurable, but improvement may take place in a few. It may occur as a result of congenital cataract, which is curable with surgical treatment (p. 639). Incurable cases if sent to a school for the blind early in life may become quite well educated, able to walk about alone, and able to earn a living.

Hare-lip is a condition in which there is a congenital fissure of the upper lip. A hare-lip is termed complete or incomplete according to whether or not it extends into the nostril; *simple*, if limited to the soft parts; *alveolar*, if the bony alveolus is involved; *complicated*, if associated with a cleft palate; *unilateral*, if single (that is, on one side only; single hare-lip occurs most commonly on the left side); *bilateral*, if double (this form is often accompanied by a complete cleft in the palate). Except in urgent cases an operation to remedy the defect is performed when the child is between the ages of six weeks and three months. In cases in which the nutrition of the infant is seriously interfered with by the deformity, the operation may be performed within the first three weeks.

For surgical nursing see Chapter XII, p. 479.

Preparation.—The child is prepared for general anaesthesia (p. 446), the last food should be given 2½ hours before operation. Purification consists of careful cleansing of the mouth and nostrils with boracic lotion. The lip and surrounding skin are well washed with soap and water, and swabbed over with a weak antiseptic solution such as Lysol (½ per cent).

Dressings.—Dry cyanide or white gauze, flexile collodion, strapping. Some surgeons use no dressing subsequently.

Position.—The infant is placed in bed on its side.

After-dressing.—The wound is dressed with a small piece of gauze, and secured by another dry piece cut in the shape of a butterfly, the narrow part fitting over the lip, the wings being spread over the cheeks; this is fixed in position by painting with flexile collodion. Deep stitches are usually removed by the surgeon on the fourth day, superficial ones being removed from the eighth to the tenth day. The dressing is maintained for some days after the stitches have been removed.

Nursing.—Careful feeding by spoon (p. 54) is necessary, care being taken not to touch the upper lip with the spoon or stretch the mouth widely open. The mother's milk may be drawn off and given in this way if the child has not been weaned. In simple cases the child may be put to the breast about the fifth day. The child must be prevented from crying, otherwise the stitches may give with the increased tension on the lip. To prevent the child touching the part, small cardboard splints should be applied to the inner side of the arm over the elbow joint (Fig. 215). For a time after the operation on a double hare-lip, the child may have difficulty in breathing; this may be remedied by drawing down the under lip with the fingers, or by painting in a vertical direction with collodion.

Complications.—Shock (p. 561), sepsis (p. 569), ununited or badly united wound owing to stitches giving way.

Cleft Palate.—A congenital defect of the roof of the mouth, whereby the structures do not unite in the middle line, thus allowing an abnormal communication to exist between the nose and the mouth. The cleft may be complete or incomplete. An operation is performed to close the cleft. Opinions differ as to what age is the most suitable, but most surgeons prefer to do it before the child has learnt to talk in order to prevent bad habits of articulation. The most usual age is between two and three years.

For *preparation* see Chapters XII and XIII, and operations on the mouth, p. 479.

Nursing.—The child is put to bed with the head low, so that any accumulation of blood or mucus may gravitate easily into the pharynx. The mouth is washed out or sprayed with a solution of Sanitas (1–40). Some surgeons prefer not to use any treatment until after the fourth day. No nourishment is given for the first 5 hours, and but very sparingly for the first 24 hours. The diet should be of either cold milk and water or albumin water (p. 816), followed by a few spoonfuls of sterilized water to prevent any particles of milk being left in the mouth. The food is best given from a cup without allowing the patient to sit up, there is then no danger of anything getting beyond the teeth and so touching the palate; if a feeder (p. 30) is used, or a spoon (p. 54), care must be taken not to touch the palate. After the fifth day soft cold food is given, and the child is allowed to sit up. An aperient is ordered within 12 hours in order to prevent gastro-intestinal sepsis due to the blood swallowed. The silver stitches are left in for ten days or a fortnight. The child is allowed up at the end of a week. Cardboard splints should be applied over the inner side of the elbows to prevent the child putting his hand in his mouth (Fig. 215). The child must not be allowed to talk until after the stitches have been removed, he should also be prevented from opening the mouth widely or crying. The nurse should on no account endeavour to inspect the palate without express orders from the surgeon. Should signs of inflammation (p. 568) appear, the wound may be sprayed with peroxide of hydrogen followed by boracic lotion; this should be done without opening the mouth widely and without inspection.

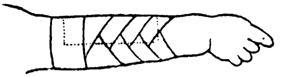


FIG. 215. Cardboard splint applied to arm. The dotted line denotes the position of the splint at the bend of the elbow.

Spina Bifida.—A condition of imperfect development of some portion of the posterior aspect of the spine, with or without a similar affection of the spinal cord and membranes. There are several varieties of spina bifida, the chief of which are: a myelocele, a meningocele, a meningo-myelocele, and a syringo-myelocele.

Description.—A spina bifida (except of the myelocele type) has the appearance of an elastic swelling in the middle line of the back: it most commonly occurs in the lower part of the spine. It may be covered by normal skin, but more commonly the skin over the swelling is thin and translucent. The defect in the vertebrae is often evident, the edges of the bones associated with other deformities such as hydrocephalus (p. 380), talipes (p. 613), perforating ulcer (p. 363), and other trophic conditions (p. 363). If the spina bifida is small and covered with healthy skin, the patient may reach adult life. If the swelling is large and covered with thin atrophic skin, the sac is likely to give way, causing death from sudden escape of cerebrospinal fluid or infective meningitis (p. 379).

Treatment.—Many cases are left alone, the swelling is protected from pressure by the application of a suitable shield or cap. In cases where the tumour is increasing in size and threatening to give way surgical interference is necessary to save life. The following methods of surgical treatment are in use:

The tumour is tapped, a small quantity of the cerebrospinal fluid is withdrawn, and then from half a drachm to one drachm of Morton's iodine fluid is injected. The child is kept in a semi-recumbent position for several days subsequently, or until all leakage has ceased.

Acupuncture.—The swelling is punctured through the thinned skin covering it, the fluid being allowed to drain away gradually into an antiseptic dressing.

Operative treatment is most commonly undertaken for a meningocele. The child is prepared for general anaesthesia. (For preparation of the child and requirements see Chapter XII, p. 460.) During the operation the child is held with the head much lower than the body in order to prevent escape of cerebrospinal fluid.

Nursing.—The child is placed in bed on its face with the head lower than the body, the foot of the bed being raised on high blocks. Stitches are removed at the end of 10 days. The dressing may require changing before this if there is any leakage of cerebrospinal fluid. The usual diet is given if the child is an infant, otherwise liquid diet for the first two days, later ordinary diet.

Complications.—Shock (p. 561), loss of cerebrospinal fluid.

Ectopia Vesicae, or Extroversion of the Bladder.—A congenital malformation in which the anterior wall of the bladder and of the abdominal parietes is absent, as a result of which the posterior wall of the bladder is exposed; the symphysis pubis is absent. There may also be pelvic malformation, complete epispadias, undescended testes, or congenital herniae (see below). The umbilicus is absent.

Treatment.—No very satisfactory treatment is known for this distressing condition. In the majority of cases a urinal is worn and care is taken to keep the parts clean and as free from excoriation as possible. Plastic operations are sometimes undertaken with success, or the ureters may be transplanted into the rectum.

Epispadias and Hypospadias.—These conditions are congenital malformations of the urethra. In epispadias the urethra is partially or wholly exposed along the upper surface of the penis. In hypospadias the lower wall of the urethra is imperfectly developed, this is the more common deformity of the two. Several varieties of hypospadias are met with according to the degree of deformity and position of the meatus. Some cases require no treatment, others are treated surgically by plastic operations undertaken to restore the urethra as far as possible.

Preparation and after-treatment of operations, see Chapter XII, p. 460.

Undescended Testicle.—A condition due to congenital imperfect development. The testicle is retained either in the abdominal cavity, or within the internal abdominal ring, or in the inguinal canal instead of descending into the scrotum about the eighth month of intra-uterine life as usual. The condition is recognized by absence of the testicle in the scrotum.

Treatment.—Surgical treatment is given. Either the testicle is removed, or it is brought down into the scrotum and retained in position by long sutures attached to a scrotal cradle. The preparation and after-treatment of the operation are as described under hernia (p. 495).

Congenital Hernia.—Due to malformations or imperfect development. The most common kind of congenital hernia is an abdominal hernia, either umbilical, inguinal, or femoral (see hernia, p. 495). An inguinal or femoral hernia may be single or double. The hernia may not be detected for some time after birth.

Treatment.—For the relief of an inguinal or femoral hernia a wool truss is worn, or an inflated rubber truss may be used. (For application of wool truss see p. 147, Fig. 98.) An umbilical hernia may be treated by applying a rubber belt with pad. Cases which do not respond to treatment may be operated upon.

Imperforate Urethra.—*Phimosis* (imperforate) is by no means uncommon. Circumcision (p. 496) is performed whilst the infant is only a few hours old. Similarly in girls, occlusion of the urethra may be due to a membrane which requires puncturing by the surgeon. It is incumbent on the nurse to discover and report these conditions without delay. (For retention of urine occurring in infants see p. 715.)

Imperforate Vagina.—This condition does not cause trouble until puberty is reached, but should be reported when noticed.

Treatment.—The membrane occluding the orifice is incised by the surgeon.

Talipes, or Club Foot.—May be a congenital deformity, or may be acquired as a result of injury, paralysis (p. 361), etc. Congenital talipes may result from imperfect formation of the bones of the foot; from intra-uterine paralysis of central origin; from malposition of the feet in utero. (For description and treatment see p. 621.)

Congenital Malformations of the Rectum.—The anus may be absent with or without development of the rectum; a membranous septum may be present between the upper and lower segments of the rectum about one inch from the anus; the anus may be present with the rectum ending blindly above the pelvic brim or opening elsewhere; the anus may be present but contracted.

Treatment is undertaken as soon after birth as possible. A contracted anus is treated by dilatation with rectal bougies (p. 63). In malformations of the rectum, the lower end of the bowel is brought down if possible and stitched in position, or a colotomy (p. 508) is performed.

Congenital Dislocation of the Hip.—May be single or double, and occurs more often in girls than boys. The condition may not be noticed until the child starts to walk. The gait is of a waddling character which is more marked if only one side is affected.

Treatment.—In children under five years of age, the Lorenz bloodless method of treatment may be undertaken. The child is anaesthetized, and the head of the femur is placed in the acetabulum by manipulations; the leg is then put up in plaster of paris (p. 179) from the pelvis to the knee in a position of abduction and slight eversion, and with the leg hyper-extended. It is maintained in this position for ten or twelve weeks, then taken down and put up again. As soon as possible the child is encouraged to crawl, and then walk on the limb in this position so as to force the head of the bone still more deeply into the acetabulum. The plaster-of-paris casing is used for six months, it is then removed and massage and exercises are given (p. 745). Older children are treated by the open method, that is, by operation. The limb is then put up in plaster of paris for as short a time as possible.

Hypertrophy of the Pylorus.—A malformation or overgrowth of the pylorus causing stenosis.

Symptoms commence two or three weeks after birth. After taking food there is not much evidence of pain, but the child vomits. Very little food passes into the duodenum and consequently the child wastes and is constipated. The stomach becomes enlarged after a time. Medical treatment is given and consists in special dieting and daily lavage of the stomach (p. 64). If this treatment fails, surgical treatment is given. Operations in these cases are often fatal owing to the low vitality of the infant from marasmus (p. 601), but Ramstedt's operation (see below) usually proves successful.

Ramstedt's Operation.—*Preparation for an infant.*—A local anaesthetic is usual (p. 444). Four hours before the operation is to take place, 60 c.c. of sterile saline are injected into the peritoneum (see p. 85). Two hours later the infant is given a warm bath. The stomach is then washed out (p. 64) with normal saline. The infant is then wrapped in cotton wool and bandaged to a special cruciform fixation splint (Fig. 216) and kept very quiet for at least one hour prior to the operation. A feeding-bottle containing glucose and water is prepared, a piece of sterilized linen being substituted for the teat and given to the infant to suck during the operation to keep him quiet. The operation only takes five minutes.

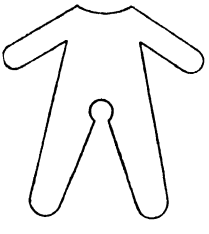


FIG. 216. Cruciform fixation splint.

After-treatment.—The infant is placed in a warmed cot. Temperature and pulse are taken hourly for 12 hours. The chief reaction is hyperthermia. After two hours the child's temperature is usually 100° F. The cotton wool and splint are then removed and the dressing fixed in place with a many-tailed bandage. If the temperature rises to 102° F. an ice-bag is applied to the head, and if there is further rise, tepid sponging is given.

Feeding commences 4 hours after the operation. Expressed breast milk is given if the baby is fed by its mother. Small quantities commencing with one teaspoonful every hour, gradually increasing until at the end of 12 hours the infant is taking 4 teaspoonfuls. Feeds are then given two-hourly, reaching one ounce every two hours. The second day the quantity is gradually increased, until by the fifth day normal diet is taken.

Webbed Fingers and Toes (Syndactylism).—In this condition the fingers or toes are joined together by a thin web consisting mainly of skin. The toes require no treatment. The fingers have the web divided, thus separating them. Other congenital deformities of the hand, fingers, and toes are: club hand; polydactylism, that is, the presence of supernumerary fingers or toes; ectrodactylism, absence of one or more fingers or toes; macrodactylism, overgrowth of one or more fingers or toes. Congenital contractions of fingers and toes are also common.

CHAPTER XIX

NURSING OF DISEASES OF THE HIP AND SPINE—DEFORMITIES

Hip Disease

The term hip disease is here applied to tuberculous disease of the joint (p. 318).

Cause.—Infection by the tubercle bacillus. The disease usually originates in the bones; either in the upper end of the femur or in the floor of the acetabulum, but it may also begin, though this is comparatively rare, in the synovial membrane.

Symptoms.—Lameness, pain, abnormal posture, alteration in the length of the limb, loss of movement, muscular wasting, tenderness, swelling about the joint, lordosis (p. 620). Pain may be entirely confined to the knee or may be present in the hip and knee. When the disease is recognized early (in the first three or four months) and is adequately treated, suppuration is rare; but in a small proportion of cases the tuberculous process is active from the beginning, and suppuration occurs in spite of careful treatment. Abscesses may be developed insidiously, or they may be preceded by long periods of high temperature, ***night-screams***, and pain on movement.

Treatment consists in absolute rest, with correction of any abnormal position either (1) by traction, by weight and pulley extension or (2), by traction by suspension. Good food, open-air and sun treatment (p. 617).

Position.—The child is put to bed and kept absolutely flat; a small pillow may be allowed under the head, but the shoulders must remain flat on the bed. The bedstead is entirely covered with fracture boards, over which a firm hair mattress should be placed. Extension by weight and pulley is applied to the affected limb (see extension, p. 149). Before applying the weight it is most important to place and maintain the limb in such a position that the anterior iliac spines are level, and the lumbar spine is in contact with the bed. If the anterior iliac spine is lower on the affected side, the limb is ***abducted***; to correct abduction, the limb is moved in an outward direction until the spines are level. If the iliac spine on the affected side is higher, the limb is ***adducted***; to correct adduction, the limb is moved inwards across its fellow until the horizontal level of the pelvis has been restored. If lordosis is present, this means that the limb is flexed on the trunk, to correct which the limb is raised until the lumbar spine is in contact with the bed. Having brought the limb into correct position, it is supported on suitable firm pillows so arranged that they cannot slip. The pulley is adjusted in a line with the long axis of the limb so that extension is made exactly in that line; this draws the head of the femur out of the acetabulum and so relieves pressure, but if this traction does not correspond to the long axis of the limb, interosseous pressure is increased instead of diminished. The amount of weight will be decided by the surgeon, in children under ten years from 2–7 lb., in young adults 6–10 lb. may be necessary. It is not to its amount so much as to its continuous action that the weight owes its efficacy in these cases. Weight extension generally quickly relieves pain, and recent deformity is soon reduced. As the deformity is reduced the position of the limb and pulley needs to be readjusted. In some cases of abduction counter-extension applied to the sound limb is necessary to correct the deformity. A Liston long splint is applied to the sound side to keep the child quiet and in position, braces and a back strap should also be worn. As soon as the limb has been brought down to an extended position, the child may be put into a plaster cast or a frame; or he may be nursed on a frame from the onset. As the acute symptoms subside the weight will be gradually left off. This is done by reducing the weight one pound at a time for an hour or so, then if no pain is experienced, and no night screams are caused, the length of time is increased each day and more weight is left off. The weight should be discontinued during the day to start with and replaced at night. When the active stage is passed the limb is immobilized in plaster of paris or Thomas's hip splint. Later the child is allowed to walk on crutches, a high boot or patten being worn on the sound foot. If an abscess occurs it is treated by aspiration if possible, otherwise by incision (see abscess, p. 464).

Traction by suspension has recently taken the place of extension by weight and pulley in the treatment of hip disease for the following reasons: The extent to which traction by weight and pulley can be increased is limited by the pull that can be maintained for a long period without causing the extension to slip. In weight and pulley extension the effect on the hip joint is reduced by the friction between the leg and the mattress. With graduated suspension the possible effective pull on the joint is increased and not reduced by this friction, this, together with the constancy of the traction, renders traction by suspension more effectual. The use of Pugh's hip frame (Plate XXXIV) allows of suspension traction with the patient in practically a horizontal position and of rotation through about 70 degrees without disturbance of the alignment of the pull on the hip joint. The frame which is fixed to a carriage (Plate XXXIV) is designed to lessen the supervision required, enable the unaffected limb to be moved and exercised. The frame can be rotated, to lessen the risk of urinary lithiasis (which, as a result of the calyces of the kidney occupying continuously a dependent position, is associated with immobilization in the strictly supine position), and allows the patient to be wheeled about in or out of doors.

Nursing.—The temperature is taken twice daily until all active disease is past: pulse and respiration should also be charted daily during the acute stage, then once a week will suffice. The urine is tested for albumin each week: if albumin is present, careful measurement of the amount of urine passed and the amount of albumin present must be recorded. To prevent the occurrence of renal calculus, when possible, the child should be turned from side to side as when nursed on a Pugh's frame or in plaster. The tendency to pyelitis in female patients is met by attention to the bowels and strict local cleanliness. When the patient is nursed in bed great care needs to be exercised in washing and attending to the back, in order that no undue or jarring movement is caused. When splints and bandages, with weight and pulley extension, are used constant attention must be given to ensure maintenance of the limb in a good position. Once a week, with the surgeon's permission, the bandages should be removed, the parts well washed, and clean bandages applied. The splint on the sound side may be removed daily for washing. Splint sores or plaster sores need to be watched for. A plaster sore may be detected by the smell; a window is cut in the plaster over the sore, or the plaster may require to be removed and reapplied.

Sun treatment is very beneficial, but also needs care in the way the child is exposed. Exposure should be commenced gradually, the upper half of the body for a start, then the lower, until the child has become accustomed to the sun so that no undue reaction, such as acute sunburn or dermatitis, occurs. Sun treatment should be avoided during the hot hours of the day as it greatly reduces the amount of urine excreted.

Diet.—A liberal diet, with plenty of butter, cream, milk, and eggs, is required. In order to prevent the formation of calculi, vegetable oxalates should be reduced to a minimum by eliminating spinach, rhubarb, coffee, cocoa, etc. It is also essential that the patient should drink from half to one pint of water on awakening in the morning, in addition to the fluids taken at or between meals in order to flush out the calyces and pelvis of the kidneys. Preparations of citrate of potash and magnesium are prescribed. Cod-liver oil or halibol are usually given to help to build up the tissues.

To lift a child suffering from hip disease.—Carry the child with the affected hip away from the nurse, i.e. if the right leg is the affected one, place the right arm under the shoulders from the sound side and with the left hand grasp the right leg just above the ankle, the sound leg resting on the nurse's left arm; the child's body must be kept flat and extended, gentle traction being made on the affected limb. If these points are carefully attended to, no pain will be caused by lifting.

Complications.—Abscess formation, albuminuria, renal calculus, other localized tuberculous affections, sepsis, acute general tuberculosis, lardaceous disease.

SPINAL CARIES, OR POTT'S DISEASE

A disease resulting in ulceration and destruction, to a varying extent, of the cartilaginous and bony parts of the spinal column. As a result of the destruction, deformity arises from the loss of substance. The deformity is caused by the column being bent on itself and so producing a projection known as an *angular curvature* or 'hump'; this is most noticeable when it occurs in the dorsal spine.

Causes.—May be due to tuberculosis (p. 318), or to debility following measles or other disease, or may result from a blow or fall.

Symptoms.—Pain, tenderness, difficulty in stooping and sitting; if the cervical spine is affected, the head will be supported with the hands. Deformity appears nine months after the onset of the disease. During the active stage of the disease the temperature will be of the remittent type (p. 196).

Treatment.—Absolute rest with immobilization in the recumbent position during the active stage of the disease is necessary. Extension by weight and pulley may be required to overcome muscular spasm. It is applied by means of extension to both legs, with counter-extension to the head (see counter-extension, p. 154). The patient may be kept immobilized by any of the following appliances: the plaster shell (p. 181), recumbent plaster jacket (p. 178), the Berck tray, Phelps's box (p. 161), Pugh's spinal frame (Plate XXXVB). For cervical caries a fillet plaster jacket is usual (p. 178). Abscesses are treated by aspiration or incision (p. 464). In cervical caries, abscesses may point in the region of the pharynx (retro-pharyngeal) (see retro-pharyngeal abscess p. 661), or cause pressure on the trachea with dyspnoea, or oedema of the glottis (p. 668). In dorsal or lumbar caries the pus may track down the psoas muscle and point in the groin, this is known as a *psoas abscess.* When the active stage is passed the spine is immobilized in a plaster jacket (p. 178) and the patient is allowed to be up for part of the day and suitable massage and exercises are given (p. 745).

General treatment consists in open-air treatment, sun treatment. Good nourishing food in liberal quantity, extra milk, butter, and eggs are necessary (see diet, hip disease, p. 617). Drugs such as cod-liver oil or some preparation of malt may be ordered. Bedsores must be guarded against (p. 16). When not nursed on a frame, for bedmaking (p. 29) and attending to the back, the patient should be carefully rolled *en bloc* by one nurse, a second nurse attending to the bed. The patient should be nursed on a divided mattress (Plate Ic) or a firm water bed (Fig. 4, p. 22). In cervical caries, if the head is not fixed in plaster, great care should be taken to keep the head absolutely in line, otherwise the neck may be broken and death ensue.

Complications.—Meningitis (p. 374), fracture of the spine (p. 542), other tuberculous lesions, general tuberculosis (p. 319), lardaceous disease (p. 581), albuminuria (p. 236), sepsis (p. 569), paraplegia (p. 361), pyelitis (p. 240), renal calculus.

Dangers.—Toxaemia, exhaustion.

For treatment of laminectomy see p. 491. Other spinal deformities will be found under deformities.

Patch test for tuberculosis.—Used for children.—The patch consists of a narrow strip of adhesive plaster on which three small patches are fixed.

The centre one is the control, the two outside patches are treated with Old Tuberculin. After cleansing the skin with spirit the application is strapped on and left in contact with the skin for 48 hours.

Positive reaction.—A red raised area with a whitish spot in the centre occurring beneath the tuberculin patches.

DEFORMITIES

May be congenital malformations (p. 608), or result from accident, injury, or disease—acquired deformity.

General treatment consists in correcting the deformity by means of splints, extension, or mechanical apparatus made according to the deformed part; massage, manipulation, and exercises to strengthen the affected muscles. In severe cases which will not yield to this treatment, plastic operations are undertaken, tenoplasty, tenotomy, osteotomy, arthrodesis, bone graft, skin graft, etc., the after-treatment being that described under the headings quoted. The chief points in nursing these cases are to see that the appliance is properly applied, and that it is in proper working order; to keep the part clean and avoid all pressure sores; to see that the prescribed rest and exercise are taken; to educate the patient into using the limb in the correct way; and provide rehabilitation occupation.

Acquired Deformities.—**Torticollis**, or wry neck, due to spasm of the muscles of the neck, may be caused by disease such as neuritis (p. 365), or may result from injury.

Treatment is that given above, if an operation is necessary, tenotomy is performed (p. 466).

Spine. — **Scoliosis**, or lateral curvature, is produced by a deviation to one side of the bodies of the vertebrae, whereby a lateral curve or twist of the spine is produced (Fig. 217).

Causes.—Rickets, constitutional weakness, standing or sitting badly in quick-growing children; in adults long standing, overtiring the muscles of the spine; or it may follow an injury.

Treatment. — Rest, constitutional treatment, removal of the cause if possible, massage, gymnastic exercises, and an appropriate support for the spine where there is a marked degree of curvature are the chief lines in treatment. Severe cases are corrected in a plaster shell (p. 181) until straightened; the affected vertebrae are then fixed in the corrected position by a bone graft (p. 491).

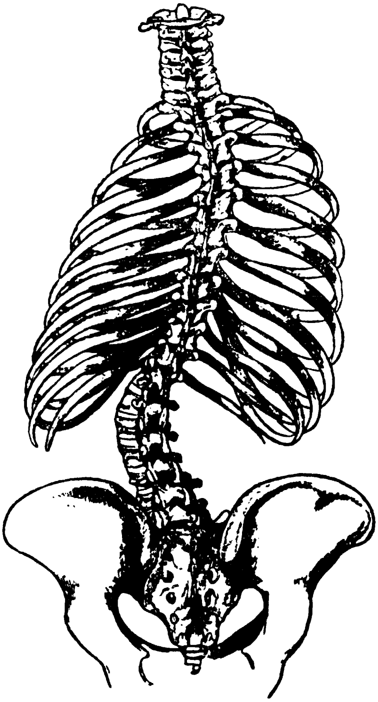


FIG. 217. Scoliosis.

Kyphosis is a condition when the dorsal spine becomes more convex or rounded.

Causes.—Defective growth, short sight (p. 642), adenoids (p. 660), bad habits such as stooping; disease of the spine (p. 618).

Treatment is that given for scoliosis.

Lordosis is an increased angular curvature in the lumbar region.

Causes.—Almost always secondary to some other condition, such as pregnancy (p. 690), enlarged abdomen, uterine fibroids, hip disease (p. 615), paralysis (p. 361).

Treatment consists in curing the cause.

Angular Curvature.—See Pott's disease (p. 618).

Dupuytren's Contraction is the name given to a contraction of the ring and little fingers, they become partially flexed and cannot be straightened.

Treatment.—An operation (p. 466) is performed to straighten them, and they are maintained in that position by splint or mechanical apparatus until cured.

Coxa Vara is a condition in which the neck of the femur is horizontal, or pointing downwards, instead of its normal position obliquely upwards.

Coxa Valga is the opposite condition.

Causes.—May be due to injury or rickets (p. 601).

Symptoms.—Pain, shortening and deformity of the leg.

Treatment.—Rest with extension and weight (p. 150) is ordered. Later, a Thomas's hip splint (p. 160) is applied, and the patient allowed to walk with a patten on the sound foot and crutches.

Genu Valgum, or knock-knees—**Genu Varum,** or bow-legs; in genu valgum the bones of the legs are bent inwards so that the knees touch, in genu varum they are bent in the opposite direction.

Cause.—Rickets in children or adolescents.

Treatment.—Consists in general treatment for rickets (p. 601); rest in bed with massage (p. 745) and manipulation to straighten the limb, application of splints (p. 157). Osteotomy is performed in cases that do not yield to treatment when rickets have been cured. (See osteotomy, p. 472.)

Talipes, or club foot, may be congenital or acquired.

Causes.—Contractions due to burns (p. 521), injuries, paralysis of certain groups of muscles (p. 361).

The various kinds are: Talipes equinus, in which the heel is drawn up, the patient walking on the toes.

Talipes calcaneus, in which the toes are drawn up from the ground, the patient walking on the heel.

Talipes varus, in which the foot is inverted and adducted, the patient walking on the outer side of the foot, the inner side being drawn up.

Talipes valgus, in which the foot is everted and abducted, the arch becomes flattened, the patient walking on the inner side of the foot.

These forms may be mixed, for instance: *Equino-varus*—the heel is drawn up and the arch increased.

Equino-valgus—the heel is drawn up and the arch flattened.

Calcaneus-valgus—the toes are raised from the ground and the arch flattened.

Treatment.—Rest, massage (p. 745), manipulative movements, exercises, and the application of plaster splints or mechanical apparatus to correct the deformity are the usual treatment.

In severe cases which will not yield to treatment, tenotomy is performed to enable the foot to be brought into good position, the foot is then immobilized on a suitable splint or in plaster of paris (see tenotomy, p. 466). Later, massage and exercises are given, and if necessary a suitable surgical boot is worn.

Flat Foot.—*Cause.*—Excessive standing or over-fatigue.

Treatment.—Metal supports may be worn in the shoes to support the arch, or in severe cases Golding Bird's sling may be used. The foot may be wrenched under an anaesthetic (p. 446), and put up in plaster (p. 162), and subsequently massage and exercises are given (p. 745). Some cases require rest, massage, and exercises only.

In very severe cases tenotomy may be performed, or a piece of bone removed from the foot; the foot is then put up in plaster of paris; later, massage and exercises are given. Walking and standing must be resumed very gradually.

Pes Cavus, or hollow or claw foot, is a condition in which the arch is abnormally increased.

Treatment is that given for talipes.

Hallux Valgus is a displacement outwards of the big toe.

Treatment.—Correct-shaped boots, with stockings in which the big toe is divided from the other toes, as a glove; massage (p. 745). In severe cases, excision of the head of the bone is performed (see operations, p. 472).

Hallux Rigidus is a painful condition of the big toe in which it becomes rigid.

Treatment is by rest and massage.

In **Hammer Toe** the first phalanx of the toe is extended, the second phalanx being flexed, producing an angle.

Treatment.—An operation to remove the head of the first phalanx is undertaken, or tenotomy may suffice. (For preparation and after-treatment of operation see p. 460.)

CHAPTER XX

OPHTHALMIC NURSING

THE *special qualifications* required in ophthalmic nursing are: light, gentle, and deft touch, observance and knowledge of the symptoms of inflammation of the various parts of the eye, and ability to apply the treatment ordered carefully and correctly.

Special care is needed in the application of drugs, the instillation of atropine instead of eserine may result in the loss of the eye. The general treatment consists in administering nourishing and suitable food, attention to the general health and hygiene, in addition to the special treatment required for the disease. (For general nursing see Chapter VI, p. 212.)

When attending purulent or infectious cases, the nurse must observe all the usual rules of disinfection (for which see pp. 47 and 316); in addition, it is important for her to protect her eyes from possible infection by wearing large plain glass spectacles provided for the purpose, before attending to the patient. The spectacles should be kept immersed in carbolic (1–20) when not in use, and carefully dried before use.

THE APPLICATION OF TREATMENT

Heat.—Heat may be applied by means of fomentations, hot bathings (moist heat), or by muff warmer (dry heat), by Leiter's coils (dry heat), and by electric thermal pad (dry heat).

Fomentations.—Cut a double fold of boracic lint into a round 3–4 inches in diameter, after boiling it in boracic lotion (or any other prescribed lotion), wring it out and apply it over the closed lids as hot as can be borne, then cover with a rather larger piece of jaconet, which in turn is covered with a pad of absorbent wool or gamgee tissue, apply a roller bandage (see bandaging, p. 133).

Hot Bathing.—Half fill a porringer with boiling boracic lotion and instruct the patient to hold the closed eyes over the steam. As soon as it can be borne, a large swab of absorbent wool is dipped in the lotion but not squeezed out, or a wooden spoon padded with wool may be used, and held near, but not touching, the closed eyelid; as the patient gets accustomed to the heat the swab is allowed to touch the eyelids, the bathing with the lids closed is then continued until the lotion becomes cool; this occurs about 10 minutes from the time the steaming started.

Muff Warmer.—Specially constructed boxes with perforated lids are used for this purpose, cartridges to fit them are also required. Two cartridges are used at a time, they are lighted at one end and placed in the box, the lighted portions of the cartridge being at opposite ends of the box. The lid is then securely applied, and the muff warmer is placed on a large pad of gamgee tissue over the closed eyelids, and securely bandaged in position with a roller bandage. Care must be taken to see that the perforated lid is away from the patient's nose. Refilling will be necessary every 4 hours.

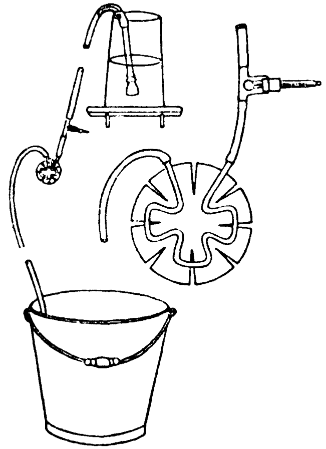


FIG. 218. Leiter's coil for the eye. The diagram on the right shows the coil with tubes and thermometer attached. The diagram on the left shows the method of connecting the tubing to the jug and pail when in use.

Leiter's Coils (Fig. 218).—Consist of small metal coils made to fit over the eyelids. They may be used either to apply dry heat or cold.

Method.—Dry heat.—The eyelids are covered with a dry cotton-wool pad (p. 627), and the coil is placed in position with the tubing with a weighted end placed in a large jug or other suitable receptacle. The lower tube is placed in a pail standing on the floor below the bed. Hot water is placed in the jug. The temperature of the water in the jug varies with the amount of tubing it will have to run through before reaching the coil, and the temperature ordered for application to the eye. It is well to have a small thermometer in glass connection inserted just before the tube reaches the coil, in this way the desired temperature may be regulated by adding hot or cold water to the jug. Care is necessary not to have the water too hot or a burn may result, on the other hand if not hot enough a good result will not be obtained. The coil is secured in place by a tie bandage. An electric light may be used beneath the jug of hot water to maintain the temperature.

Cold.—A piece of lint is wrung out of iced boracic and applied to the closed lids, the coil is then placed in position over the lids and secured with a tie bandage. Iced water is run through the coil continuously.

Application of Cold.—Ice-flap (Fig. 219).—Six flaps of double white lint are placed on a block of ice in boracic lotion. A flap is then partially wrung out and applied to the eye by hanging it over a narrow strip of bandage tied around the patient's head. These flaps require changing every 10–15 minutes.

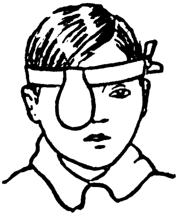


FIG. 219. Lint flap applied.

Ice-bag.—A small bag is made of gutta-percha tissue sealed with chloroform, a small piece of drainage tubing being inserted into the lower outside edge. The bag is filled with small pieces of ice and salt, and applied to the eye over lint wrung out of iced boracic. The free end of the tube is placed in a small receptacle to catch the water as the ice melts. Ice poultice, see p. 93.

Cold Douching, or Ducking.—This treatment is frequently ordered in cases of photophobia (p. 625); after several applications of the treatment the spasm of the orbicularis muscle is much reduced, and the patient is able to open the eyes.

Method.—A wash-hand basin is half filled with cold water, the patient's face is then ducked under the water about 10 times; this treatment is objected to at first especially by children, but after a time they quite enjoy it.

Lotions.—Lotions are employed in treating affections of the conjunctiva, or for cleansing the conjunctival sac. Those most generally used are: boracic; salt solution; perchloride of mercury (1–5000); quinine, 4 gr. to the ounce; sulphate of zinc, 1 gr. to the ounce.

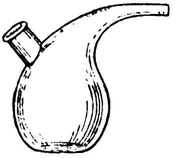


FIG. 220. Undine.

To apply lotion.—Have the patient lying flat, if in bed; if up, in a chair with the head thrown well back. Separate both lids and allow a continuous stream of lotion to flow from the inner canthus to the outer. The lotion should not be run in from a height of more than 2 inches. The clothing and bed must be protected with a towel or mackintosh, a receiver being placed in position to catch the lotion. In some cases everting the lids will be necessary. Lotion may also be applied by means of an undine (Fig. 220), or an irrigator with a glass nozzle may be used. In cases needing a very thorough washing-out, a specially constructed nozzle is used instead of the usual glass one; it is made of thin metal and has a flattened and slightly curved end by the means of which the upper fornix, which is not brought into view by eversion, is washed out. The temperature of lotion used should be 99° F. unless otherwise ordered.

To evert the Upper Lid.—Stand either in front of, or behind, the patient, instruct him to look at the floor. Lightly grasp the lashes of the lid between the thumb and forefinger, then draw it slightly downwards, and placing the forefinger of the free hand, or a probe, upon the upper part of the lid to act as a fulcrum, turn the lid upwards.

To evert the Lower Lid.—Direct the patient to look upwards, then draw the skin immediately below the eyelid downwards.

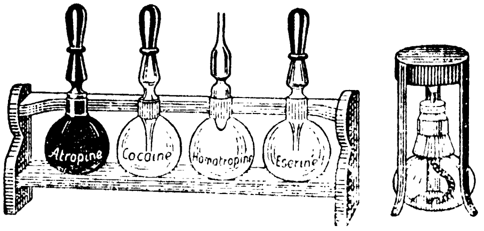


FIG. 221. Drop bottles and stand for sterilizing same.

To apply drops.—Drops are instilled either to act on the diseased conjunctiva or upon the interior structures of the eye. In the first case after instilling the drop, the lids are drawn gently upwards and downwards respectively to admit of the drops reaching the whole conjunctiva. In the second case the drop is instilled only into the lower conjunctival sac.

Method.—Instruct the patient to look upwards, draw down the lower lid, and allow one or two drops to fall into the conjunctival sac. In cases in which there is a wound in the eye, the drops should be slightly warmed before instillation to prevent the patient flinching or squeezing the lids. Contact between the conjunctiva or lashes and the dropper used for instillation must be avoided. A variety of drop bottles are in use, but those that allow of sterilization are the best (Fig. 221). Drops and drop bottles should be sterilized daily before use.

Powders.—Powders may be applied to the conjunctiva or the cornea. Those most commonly prescribed are boric acid, calomel, and dermatol. They are applied by means of an insufflator, or the powder may be flicked into the eye from a camel-hair brush. Caution is required when applying calomel as, if it is allowed to remain in the conjunctival sac in too large a quantity, it will act as a caustic and destroy the superficial layers of the mucous membrane.

Ointments are prescribed as applications for the conjunctiva, the cornea, to act on the pupil, and for the edges of the eyelids.

Method.—When applying ointment in either of the first three instances proceed as follows: Use a small glass rod with rounded ends. Take a sufficient quantity of the ointment on to the end of the glass rod, draw down the lower lid slightly, place the rod lengthwise between the lower lid and the globe, then instruct the patient to close the lids gently and withdraw the rod through the outer canthus. In some cases this may be followed by gentle massage in which one finger, placed upon the closed lids, is lightly moved in a circular, horizontal, or vertical direction. When prescribed for disease of the margins of the lids, instruct the patient to look up, place the rod with the ointment lengthwise on the edge of the lower lid, tell the patient to close the lids, then withdraw the rod through the outer canthus. In other cases it may be necessary to apply the ointment by gently rubbing it on the margins of the lids with a swab twisted round a glass rod. Any superfluous ointment is wiped away with a clean swab.

Lamellae are tiny gelatine discs containing drugs. To apply, take one on the end of a glass rod and place inside the lower lid.

Pad and Bandage.—A pad and bandage is ordered in all cases in which there is a wound or abrasion of the cornea, and in cases in which it is necessary to keep the eye at complete rest, to apply heat, and after the majority of operations on the globe.

Pads are made by cutting circular pieces of cotton wool or gamgee tissue, which are then sterilized by the dry method (see sterilization, p. 40). If plain absorbent wool is used, a fold of gauze is placed over the eye before applying the pad.

When applying a pad over the eye, care must be taken to see that the lids are closed, otherwise discomfort will be caused by having the lashes turned in (see entropion, p. 637). A 2-inch roller bandage may be used, or a tie bandage is sufficient in simple cases.

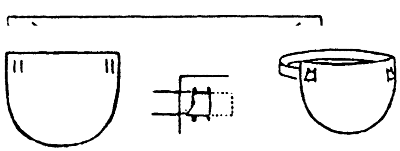


FIG. 222. Cardboard eye shade. On the left is seen the way to cut out the cardboard; in the middle, the method of fixing the band in the shade; on the right, the shade completed.

Shades.—Shades are used either to cover the eye completely or to protect the eye from a bright light whilst still allowing it to be used. Those intended to cover the eye are made of plaited straw or pink celluloid, a small piece of lint or wool should be worn underneath. Those intended for shading the light from the eyes are made of cardboard covered with green glazed linen and made to fasten round the head with a tape. Another kind is made simply of thin grey cardboard cut about 6 inches wide and 5 inches long; two vertical slits are made near each end through which a narrow strip of cardboard is passed which encircles the patient's head (Fig. 222).

Buller's Shield.—Buller's shield consists of a watch glass inserted in a square of white adhesive rubber plaster (Fig. 223). It is used to cover the sound eye and so prevent it becoming infected in cases of purulent conjunctivitis (p. 632).

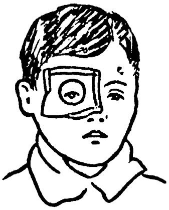


FIG. 223. Buller's shield applied.

To make the shield.—Cut a square of adhesive plaster of the required size, and in the centre of it cut a round hole rather smaller than the watch glass. Cut a second square of plaster 1 inch smaller except at the lower and outer border which is of the same size, cut out a circular hole the same size. Place the first square over the watch glass with the sticky side fixed around the edge of the convex side of the glass, fit the second square on to the first, the sticky surfaces together; this will leave all the sticky surface covered in, except 1 inch around the edge for fixing to the skin, with the watch glass fixed between the two surfaces.

To apply.—Fit the glass over the patient's sound eye, trim the edges of the plaster to fit and stick it down. Seal the plaster down with further strips of strapping if necessary as follows, one across the forehead, one on the nose and one along the cheek. The opening is left on the outer side of the eye to allow of ventilation and also for the escape of any discharge or tears. Care must be taken to see that the shield fits closely and firmly along the nose so that no discharge from the affected eye can penetrate. Collodion and dry wool may be used if the strapping is not sufficient.

Artificial Eyes are worn in order to conceal the loss of the natural one and, at the same time, to protect the empty conjunctival sac.

To insert an Artificial Eye, draw the upper lid forward with the left hand, tell the patient to look down, and gently push the artificial eye, previously moistened with water, with the right hand, beneath the upper lid in an oblique direction. As soon as it touches the upper fornix, turn its nasal part inwards, fix its lower border with the left thumb, and pull the lower lid downwards beneath the lower edge of the glass eye; it will then glide into the conjunctival sac.

To remove an Artificial Eye, tell the patient to look upwards, draw the lower lid downwards, place the tip of the right forefinger, or a probe, beneath the lower border of the artificial eye; next press gently on the upper lid from above, the eye will then glide slowly forwards and downwards, when it should be grasped with the right hand. The patient should practise this in front of a mirror for himself. The artificial eye should be removed before going to bed, and cleansed with soap and water. It should not be left to soak in water all night, but may be placed now and again in a weak solution of spirit and water. The conjunctival sac should be cleansed at night with a weak solution of perchloride of mercury (1–5000). Should catarrh or inflammation occur, the eye should not be worn for a few days. Artificial eyes require renewing every nine months or yearly, lest their surface becoming rough and defective, irritation and inflammation of the mucous membrane should result.

POINTS TO BE NOTED WHEN DRESSING AN EYE

Condition of the Lids and lashes, presence or absence of discharge, character of any discharge present.

Conjunctiva, whether injected (bloodshot), or swollen (chemosis). *Injection* due to conjunctival disease is spread over the whole conjunctiva; that caused by internal inflammation of the eye (ciliary body), i.e. *ciliary injection,* consists of a pink flush immediately around the cornea; both kinds of injection may be present.

Cornea, whether bright and clear, or hazy; presence or absence of corneal opacities (nebulae, leucoma).

Anterior Chamber, whether the aqueous humour is clear or turbid, presence of blood in the chamber (hyphaema), or pus (hypopyon), presence of lens matter coming forward; whether the chamber is normal, deep, or shallow.

Iris.—Colour, whether normal, yellowish green or muddy.

Shape of Pupil, whether regular or irregular, an irregular pupil may be due to adhesions of the iris (synechiae); whether the pupil is dilated (mydriasis), contracted (myosis), or semi-dilated.

Reaction of Pupil, whether brisk, sluggish, or paralysed. Argyll-Robertson pupil is one that reacts to accommodation but not to light, occurs in connection with some nervous diseases (see locomotor ataxy, p. 371).

Eyeball, whether prominent (proptosis, exophthalmos), or retracted (enophthalmos).

Nystagmus.—Tremor of eyeball. This may be associated with defective vision (congenital cataract), or due to a lesion in the brain (see diseases of the brain), and occurs in some diseases of the nervous system (see Chapter IX) and of the ear (p. 209). The tremor may be from side to side, or up and down.

Tension of the Eyeball.—Whether normal, increased, or diminished. Tension must not be tested by a nurse unless she is experienced in the treatment of ophthalmic cases.

To test tension.—Direct the patient to look towards his feet, then standing immediately in front of him, place the two thumbs on the cheek bone of the eye to be tested, the two middle fingers on the brow, and with the two forefingers press on the eyeball gently through the upper eyelid, using first one finger then the other, but not removing the fingers from contact with the lid. The sound eye should be tested first, the affected eye being then compared. Normal tension is when the eyeball is about the consistency of a ripe plum. When the eye is harder than normal the tension is said to be plus, and may be $+1$, $+2$, $+3$ according to the amount of increase. When the eyeball is softer than normal it is said to be minus, and is indicated by the terms -1, -2, -3.

INFLAMMATORY CONDITIONS OF THE EYE

Lids.—**Blepharitis,** or inflammation of the eyelids.

Cause.—Irritation or infection, overstraining the eyes.

Symptoms.—Swollen and painful edges to the lids, small pustules (p. 189) around the lashes with some discharge.

Treatment.—Application of lotions and ointment. The eyes should be rested, exposure to sand, dust, and other irritating conditions should be avoided; any error in refraction should be corrected by suitable glasses.

Hordeolum, a stye; a furuncular inflammation of the connective tissue of the lids, near a hair-follicle. **Zeissian Stye,** hordeolum externum; a stye produced by suppuration of one of the Zeissian glands.

Treatment.—Epilation of the lash in the vicinity will often be sufficient to reduce the inflammation. Hot bathing frequently and incision of the swelling may be necessary. Recurrent styes may be due to debility, or constitutional disease requiring medical treatment in addition to the local treatment. Styes may also be due to errors in refraction (p. 641).

Meibomian Stye (chalazion), one produced by suppuration of a Meibomian gland.

Meibomian Cyst (chalazion calculus), a tumour of the eyelid due to retained secretion of the Meibomian glands, appears as a small round swelling on the inner side of the eyelid. The eyelid is incised on its inner aspect and the cyst removed. No dressing is required after the first few hours.

Conjunctiva.—Conjunctivitis or ophthalmia may be of the following varieties:

Catarrhal Conjunctivitis.—This is a non-purulent or mildly infectious type, and is commonly known as a 'cold in the eye.'

Causes.—Cold, foreign body in the conjunctiva, infection.

Symptoms.—Injection, redness of the lids, pain, discharge.

Treatment.—Removal of the cause if possible. Application of lotions (p. 625) and ointment (p. 626). A shade should be worn to protect the eyes from light but not to cover them (Fig. 222).

Granular Conjunctivitis or Trachoma is a contagious disease (p. 317). Small granules form on the inner surface of the lids, they resemble sago grains.

Symptoms.—Injection, redness of the lids, pain.

Treatment.—Application of lotions (p. 625) and ointment (p. 626). Caustics may be applied to the inner surface of the lids, bluestone is commonly used. General attention to the health is important, i.e. good food, fresh air, tonics. The patient should use separate washing utensils, etc., which must be treated as infectious (p. 47).

Diphtheritic Conjunctivitis.—*Cause.*—Infection of the conjunctiva with the diphtheria bacillus (see p. 349). Infection may occur through a patient suffering with diphtheria coughing into the attendant's eye whilst having the throat attended to.

Symptoms.—Injection, pain, presence of false membrane on the inner surface of the lids.

Treatment.—Application of quinine lotion (p. 625) every 2 hours, atropine, pad, and bandage or flaps. A Buller's shield (p. 628) should be applied to the sound eye. The prompt use of antitoxin and general treatment for diphtheria is given. This disease is treated as infectious as described under diphtheria.

Phlyctenular Conjunctivitis is an inflammation of the conjunctiva with the formation of one or more yellowish pustules at the limbus of the conjunctiva covering the eyeball. The pustule commences as a small papule (p. 189) which looks vesicular.

Causes.—Occurs in tuberculous (p. 318) children or in those who are underfed and live in unhygienic surroundings.

Symptoms.—Watering of the eye (lachrymation), conjunctiva, injection, intolerance to light (photophobia).

Treatment.—Application of boracic lotion and yellow oxide of mercury ointment is the local treatment prescribed. Constitutional treatment is most important and comprises healthy surroundings, good nourishing food, fresh air, regulation of the bowels, tonics, and cod-liver oil. A shade (Fig. 222) is worn over the eyes, and no near work allowed. The child must not be allowed to remain in the dark or lie with its face buried in its pillow, as this increases the photophobia. To prevent the child rubbing its eyes, cardboard splints should be applied to the inner side of the elbows and so prevent bending the arms (Fig. 215, p. 610). Cold ducking is found to be of great benefit in these cases (p. 625).

Muco-purulent Conjunctivitis, or Pink Eye, is due to a specific organism, Koch-Weeks bacillus. It is highly infectious and occurs commonly in schools.

Symptoms are those of catarrhal conjunctivitis accompanied by a muco-purulent discharge.

Treatment.—Frequent irrigation (p. 625) with weak antiseptic lotion—perchloride of mercury 1–5000—application of Protargol drops, and ointment to the lids at night to prevent them sticking together. The patient is isolated. Complete rest to the eyes is essential. Good food, tonics, and fresh air are required.

Purulent Ophthalmia is of two varieties: *ophthalmia neonatorum*, that is, purulent ophthalmia occurring in the newborn infant (p. 714), and the same disease occurring later in life known as *gonorrhoeal ophthalmia* (see gonorrhoea, p. 324).

Cause.—Infection of the conjunctiva with the gonococcus. In the infant the eyes become infected during, or after, birth when the mother has a gonorrhoeal discharge (see p. 324). In adults, patients suffering from gonorrhoea may infect their eyes, or it may be contracted from someone suffering from the disease, hence the need of treating these patients as strictly infectious (p. 316).

Symptoms.—Conjunctival injection with discharge, at first of a watery mucus, later of creamy pus. The lids become red, hot, and swollen; later, if not properly treated, the cornea becomes ulcerated, then perforates with prolapse of iris, injury to or loss of the lens, and may result in permanent blindness.

Treatment.—Isolate the patient (p. 9). The conjunctival sac is thoroughly cleansed from pus every 15 minutes. This is done by gently separating the eyelids and allowing a stream of cold perchloride of mercury (1–5000) to flow in, all discharge from the outside of the lids being cleansed with the same lotion. Great care is needed in separating the lids not to use any pressure or the cornea may be perforated. When the lids are very swollen and brawny retractors should be used. Every 2 hours the conjunctival sac is thoroughly irrigated with the same lotion, the same care and precautions being taken. Once a day the lids are everted and painted with nitrate of silver. Ice-flaps (p. 219) may be applied, or the eye may remain uncovered. Some surgeons adopt continuous irrigation, as follows: An irrigator filled with cold normal saline solution is placed at a suitable height above the patient's head so that the fluid drips. The patient lies inclined over towards the affected side. A mackintosh is arranged to protect the bed and a receiver is fixed in position against the cheek so that the lotion is caught. The flow is regulated to a fast drip and the nozzle of the irrigator is fixed in position at the inner canthus of the affected eye. It must be in such a position that it is quite near, but does not touch the eyelids. The patient is instructed to open the eye periodically, in this way the fluid runs in, and out at the outer canthus, thus washing the conjunctival sac. In addition to the continuous irrigation, the irrigation with an antiseptic lotion as described above is given. The patient is kept lying on the affected side in order that the discharge runs away from, and not towards, the sound eye. The unaffected eye is protected with a Buller's shield (p. 628). The sound eye must never be touched with anything used for the infected eye, the nurse must carefully cleanse and purify her hands (p. 10) before attending to the unaffected eye. The patient remains in bed during the acute stage. Abundance of nourishing plain food is given. The bowels are carefully regulated. Drugs may be necessary to relieve pain and to promote sleep, although in the acute stage the patient has to be constantly disturbed during the night for cleansing the conjunctiva. Should the patient be suffering from the disease in any other form, treatment is given for the condition (see gonorrhoea, p. 324). Nurses whilst attending these cases should wear plain glass goggles constantly in order to avoid infection. Overalls should also be worn and the case treated in every other respect as described under nursing in infectious diseases (p. 316). In order to prevent infection in the newly born the mucus should be wiped from the eyelids, the eyes should then be bathed directly the head is born (see p. 699), and again after the bath. One drop of nitrate of silver (1 per cent) is then instilled into each eye as a preventative if there is any suspicious discharge from the mother. The infant's eyes are bathed night and morning subsequently; should the conjunctiva become injected (p. 629) or any discharge be present, medical advice must be sought immediately. The treatment of ophthalmia neonatorum is that given under purulent ophthalmia, except that the infant's eyes are not irrigated so frequently, but swabbing is done in the same manner. The lids are everted and painted with nitrate of silver once a day, or argyrol or other protein preparation of silver is instilled once or more times a day.

Xerophthalmia (dry eye), a disease of the eyes peculiar to childhood caused by deficiency of vitamin A (see p. 302), which is characterized by the suppression of tears and a dry and thickened

condition of the conjunctiva. Night blindness is an early symptom. If the condition is not relieved by supplying the vitamin, complete blindness results. (For sources of vitamin A see p. 785.)

Cornea.—**Inflammation of the Cornea** (keratitis) may result from conjunctivitis, constitutional disease, or from an injury. The cause is treated.

Pannus.—This is a newly formed, very vascular tissue, extending beneath the epithelial layer of the cornea.

Causes.—Trachoma (p. 631), phlyctenular conjunctivitis (p. 631).

Interstitial Keratitis is an inflammation of the deeper layers of the cornea.

Causes.—Congenital syphilis (p. 605); debility; insufficiency of food and unhygienic surroundings.

Symptoms.—Conjunctival injection (p. 629); hazy cornea, photophobia (p. 631), pain.

Treatment.—Penicillin ointment (p. 841). Hot bathing (p. 623), atropine, muff warmer (p. 624). Treatment for the general health is important and consists of nourishing food, fresh air, careful regulation of the bowels, and attention to the general hygiene of the patient's body and the surroundings.

Ulceration of the Cornea.—*Causes.*—Abrasions of the cornea, conjunctivitis (p. 631), keratitis, general debility following an acute illness such as measles (p. 333).

Symptoms.—Photophobia, pain, conjunctival injection, watering of the eye (lachrymation), opacity on cornea (see leucoma, glossary).

Treatment.—Atropine, or in some cases eserine; hot bathing (p. 631), muff warmer or Leiter's coils (hot), pad and bandage. The ulcer may be cauterized by the surgeon either with the actual cautery, or pure carbolic. Hydrogen peroxide or chlorine water may be ordered for instillation before bathing the eye. The general health needs careful attention. Good food, tonics, and fresh air are important, as the patient is always in a debilitated condition. Careful regulation of the bowels is a necessity.

Complications.—Hypopyon (see below), perforation, prolapse of iris.

Hypopyon.—The name given to pus in the anterior chamber, appearing as a small yellow opaque or crescent half-moon in the lowest part of the anterior chamber.

Cause.—Secondary to other affections of the eye.

Treatment.—Hot bathing (p. 631), atropine, muff warmer (p. 624), or Leiter's coils (hot) or electric thermal pad. Leeches (p. 103) or blisters (p. 95) may be ordered. The cause of the hypopyon is treated. An aperient is usually ordered, commonly calomel. In the majority of cases, after treatment, the hypopyon becomes absorbed, but should it persist it may be evacuated by paracentesis (p. 637).

Iris.—Iritis, or inflammation of the iris.

Causes.—Injury, secondary to operations on the eye, or to septic conditions of the eye; syphilis (p. 322), gout (p. 312).

Symptoms.—Severe pain, photophobia (p. 631), conjunctival injection (p. 629); the iris becomes a greenish muddy colour, the pupil is contracted and may be irregular owing to synechiae; the cornea may be hazy, and the tension may be increased (p. 630).

Treatment.—Hot bathing (p. 623), frequent instillations of atropine, muff warmer or Leiter's coils (hot); leeches (p. 103) are commonly ordered. The eye is kept covered with a pad and bandage. Drugs may be necessary for the relief of pain. The cause of the iritis is treated. The bowels should be kept freely open.

Complications.—Hypopyon, adhesions, or synechiae.

Ciliary Body.—Cyclitis, or inflammation of the ciliary body.

Causes.—Infection, iritis.

Symptoms.—Pain, ciliary injection, the cornea may be hazy, and tension may be increased (p. 630).

Treatment.—That given under iritis.

Choroid.—Choroiditis, or inflammation of the choroid.

Cause.—Secondary to other diseases.

Treatment.—Complete rest to the eye, treatment of the cause.

Retina.—Retinitis, or inflammation of the retina.

Causes.—Injury, or secondary to other diseases.

Symptoms.—Inability to see. Pain, headache.

Treatment.—Complete rest to the eye. Treatment is given for the cause.

Detached Retina.—A condition in which a portion of the retina becomes detached from the choroid owing to an accumulation of fluid behind it.

Causes.—A blow, myopia (p. 642).

Symptoms.—Loss of vision.

Treatment.—Complete and absolute rest in bed in the recumbent position is necessary. The patient is on no account allowed to turn over or to sit up, one small pillow is allowed. Fluids are restricted. Hot packs (p. 109), with the administration of pilocarpin hypodermically, are given daily or every second day. Atropine is ordered and dark glasses are worn. The bed should be back to the light. The eyes are not allowed to be used for reading or writing, and the patient is not allowed to help himself in any way until the surgeon gives his permission. These patients are kept flat in bed for six weeks, as a rule. May also be treated by operation.

Optic Nerve.—Optic Neuritis or inflammation of the optic nerve.

Cause.—Injury, secondary to other diseases of the nervous system.

Treatment.—Absolute rest to the eyes is essential. The cause is treated. Inunction with mercurial ointment is usually prescribed, and mercury is given internally (see inunction, p. 97). Patients undergoing this treatment must be given frequent mouth washes (p. 15), the teeth should be cleansed three times a day. The nurse must be on the watch for signs of mercurial intolerance (see p. 774) and report to the physician in charge if they occur.

Dangers.—Optic atrophy resulting in permanent blindness.

Eyeball.—Panophthalmitis, a general inflammation of the globe.

Causes.—Injury, infection.

Treatment.—Enucleation (p. 639) is performed.

Lachrymal Duct and Sac.—Stenosis of the lachrymal duct.

Symptoms.—Tears running over (epiphora), discharge from the inner canthus.

Treatment.—The duct is dilated by means of lachrymal probes, the lachrymal sac may require to be washed out subsequently with a lachrymal syringe; this treatment is not as a rule entrusted to the nurse.

DISEASES OF THE EYE REQUIRING SURGICAL TREATMENT

For preparation of the room, the general technique, and the preparation of the patient see Chapter XII; for general anaesthesia see p. 446.

Preparation for local anaesthesia (p. 444).—The patient is given an efficient aperient the preceding evening. The urine is tested (p. 35). A light meal of tea and bread and butter is given about 2 hours before the operation is to take place. The eye is purified over-night and again the following morning.

Purification.—The face, brows, and the outside of the lids are thoroughly cleansed by washing with soap and water; the eyelashes are cut, using vaselined scissors, only if ordered by the surgeon; the conjunctival sac is then irrigated with either sterilized normal saline solution, boracic lotion, or perchloride of mercury (1–5000) as ordered. A compress consisting of lint wrung out of perchloride of mercury (1–5000) is then applied and covered with gutta-percha tissue, and a pad and bandage, which is renewed in the morning. Observation must be made as to whether any discharge is present on the lint when the compress is removed; if so, the fact is to be reported to the surgeon and the compress kept for his inspection.

To anaesthetize the eye.—Instil one or two drops of sterile solution of cocaine (4 per cent) into the eye every 3 minutes for 15 minutes before the operation, also one or two instillations of adrenalin are commonly ordered. The sound eye should have two instillations of cocaine during the 15 minutes. Direct the patient to keep the eyes closed during the whole time, this is important or the epithelial layer of the cornea may be damaged.

After-treatment of operation cases.—The patient is put to bed in the recumbent position until the wound has healed. Soft food requiring little mastication should be given in all cases of incision into the globe. The bowels are carefully regulated, constipation must be avoided so as to avoid any straining. The patient should be warned against sneezing, coughing, or squeezing the lids. (For general nursing of operation cases see p. 460.)

OPERATIONS

Lids.—These are chiefly for the removal of Meibomian cysts (p. 630), growths, or plastic operations for the cure of ectropion, entropion, and ptosis (drooping eyelid). General anaesthesia (p. 446) is usual. The patient is kept in bed for one or two days. Stitches are removed at the end of a week.

Conjunctiva.—Operations may be undertaken for the removal of cysts or growths. Cocaine anaesthesia is usual. The patient is kept in bed one day. Stitches are removed at the end of one week.

Muscles.—Operations are undertaken for the cure of strabismus (p. 642). Tenotomy or division of the shortened tendon may be performed, or ' advancement ' shortening of the lengthened tendons. Either general or cocaine anaesthesia is given. The patient is kept in bed for two days with both eyes bandaged. Stitches are removed at the end of a week, exercises are then given to teach the patient to use the muscles correctly.

Anterior Chamber.—**Paracentesis**, or curette evacuation, may be performed to empty or relieve the anterior chamber of part of its contents. Performed in cases of increased tension (p. 630), for the evacuation of swollen lens matter, to evacuate a hypopyon (p. 634).

Local anaesthesia is necessary in most cases. Children having curette evacuation performed usually have a general anaesthetic (p. 446). Patients are kept in bed for several days until the wound in the cornea has healed and the anterior chamber is re-formed; this occurs rapidly after paracentesis, but takes longer after curette evacuation.

Dressing, twice or thrice daily, atropine, pad, and bandage. The patient is kept in the recumbent position until the anterior chamber has re-formed.

Iris.—**Iridectomy,** or removal of a portion of the iris, is the most common operation performed on the iris. Undertaken as a preliminary to cataract extraction, for glaucoma (p. 643), synechiae (p. 629), to make an artificial pupil in cases of leucoma, for prolapse of iris.

Local or general anaesthesia is required according to the condition of the patient and the circumstances for which the operation is undertaken. The patient is kept in bed in the recumbent position for three or four days to a week, or longer in some cases of glaucoma or injury.

Dressing, twice daily, drops may be ordered or not, and vary with the disease or condition for which the operation was undertaken, pad and bandage. Dark glasses are worn at the end of ten days or earlier, if all is satisfactory.

Complications.—Iritis (p. 635) loss of vitreous, sepsis.

Lens.—Operations are performed on the lens for its removal when it has become opaque (cataract). *Cataract* may be congenital, traumatic, senile, or due to diabetes (p. 289). In cases in which the lens has become hard, as in senile cataract, it is removed whole, i.e. extraction; in other cases where the lens is soft it is removed by tearing the capsule and breaking up the lens, i.e. needling or discission, followed by curette evacuation of the lens matter when it has come forward.

Extraction.—*Local anaesthesia* is usual unless the patient is unsuitable. The patient is kept in bed in the recumbent position for three days. Both eyes are bandaged. *Dressing* is done once a day for the first two days, then twice daily, atropine, pad, and bandage. The pad is left off the sound eye on the second or third day, dark glasses are substituted for the pad and bandage in the daytime on the tenth day, the eye being bandaged at night only. The patient is allowed to sit up in an arm-chair on the fourth day, but not to walk about, stoop, or exert himself in any way. Some surgeons do not allow the patient to get up until the end of a week. Should the patient become restless and uneasy with having both eyes tied up, the sound eye is uncovered, with the surgeon's consent, as some old people cannot tolerate both eyes being tied up. Soft food of a light and digestible character is given. The bowels are opened on the third day by a dose of castor oil followed by an enema (p. 60) before an action takes place, in order to avoid any undue strain which might reopen the wound in the cornea. Every care must be taken to prevent any pressure, knock, or jar due to sneezing, or straining which might reopen the wound, or retard healing, or cause loss of vitreous. A papier-mâché shield may be applied over the pad to protect the eye from pressure or rubbing. Some surgeons have the patient's hands tied loosely (see clove hitch, p. 148) to the sides of the bed at night to prevent any rubbing of the eye during sleep.

Complications.—Iritis, loss of vitreous, sepsis, delirium (p. 359).

Discission, or Needling.—Performed for breaking up a soft (congenital) cataract, and for tearing through the remaining capsule after extraction and curette evacuation.

Local anaesthesia is sufficient, except in the case of young children. Subsequently the patient is put to bed in the recumbent position for two or three days, then allowed up if there is little or no reaction.

Dressing twice daily, atropine, pad, and bandage. Cases in which the lens matter is coming forward quickly are kept in the recumbent position and ice-flaps (p. 625) are substituted for the pad and bandage. Atropine is instilled and curette evacuation performed as soon as the lens matter comes forward.

Symptoms of excessive reaction: Pain, semi-dilated or contracted pupil, discoloration of iris, vomiting, increased tension (p. 630). The nurse must inform the surgeon should these symptoms be present, as prompt treatment is needed for their relief.

Needling after cataract extraction or curette evacuation has been performed is a very simple operation. Local anaesthesia is usual. The patient is put to bed in the recumbent position for one day, then allowed up in straightforward cases. Dressing twice daily, atropine, pad, and bandage. Dark glasses at the end of three days, the patient is then allowed out. In almost all cases of discission or needling, the pupil is dilated with atropine before the operation. A contracted pupil after any needling operation is an unfavourable sign.

Sclerectomy (trephining).—An incision is made in the conjunctiva under the upper lid, a flap is turned down, exposing the limbus (junction of the cornea and sclerotic); trephining is done at this margin, producing a permanent perforation through which the fluid in the anterior chamber can drain under the conjunctiva.

Sclerotomy.—An incision made with a broad needle through the sclerotic. Performed to relieve tension.

General anaesthesia is necessary when the eye is painful, i.e. in acute cases, otherwise cocaine is given. After-treatment is that given under paracentesis (p. 637).

Eyeball.—Removal of the eye may be performed by enucleation (excision), evisceration, or by exenteration of orbit. Undertaken when the eye is hopelessly diseased, or in cases of severe injury, or for sympathetic ophthalmia (p. 643).

Enucleation, or Excision.—*General anaesthesia* is required (p. 445). The patient is kept in bed for two or three days subsequently. Dressing twice a day, pad and bandage. The pad and bandage is worn for ten days, after which a celluloid shield is substituted. The patient is not kept in the recumbent position after the first 24 hours. Should haemorrhage occur, a graduated pad is applied with a firm bandage, this usually suffices; in severe cases the orbit is syringed out with hydrogen peroxide and tightly packed with gauze soaked in hydrogen peroxide or adrenalin.

Complications.—Haemorrhage, sepsis.

Evisceration.—This operation consists in the removal of the contents of the eyeball without removal of the globe. The sclerotic is emptied of its contents, and a glass ball may be inserted to take the place of the removed contents, the sclerotic and conjunctiva being stitched over the ball. Subsequently the artificial eye is fitted over the globe and moves in all directions as the muscles remain intact. This operation, with insertion of a ball, is known as Mules's operation.

General anaesthesia (p. 446) is required. The patient is kept in the recumbent position till all swelling has subsided. There is usually much reaction and pain for the first three days.

Dressing.—Ice-flaps (p. 625), ice-bag, or Leiter's coil (cold) (p. 624). The lids are cleansed every 2 hours to remove any discharge (p. 625). Ice-flaps require changing every ten minutes. Stitches are removed in ten days, and a celluloid shield is worn when the wound has healed.

Temperature, pulse, and respiration are taken every 4 hours till normal, then twice a day.

Exenteration of Orbit is a severe and extensive operation undertaken for malignant disease of the eye or orbit. It consists in the removal of the eye together with the contents of the orbit.

General anaesthesia (p. 446) is necessary. The patient remains in bed ten days to three weeks.

Daily dressing, gauze plugging, pad, and bandage. The orbit is irrigated with perchloride of mercury (1–4000), peroxide of hydrogen may also be required.

Temperature, pulse, and respiration are taken four-hourly till normal, then twice a day.

Complications.—Haemorrhage (p. 563), shock (p. 561), sepsis (p. 569).

INJURIES TO THE EYE

The most common of these are foreign bodies which may be present in the conjunctival sac, for removal of which see first aid (p. 525); in the cornea, these are removed with a spud or a broad needle after cocainizing the eye (p. 637); in the lens, removal of the lens is required; in the vitreous, choroid, or sclerotic, a magnet is used if the foreign body is magnetic, otherwise the eye will probably have to be removed.

Burns may be caused by fire, caustics, or corrosives (p. 524). For burns caused by heat, instil castor oil and apply flaps smeared with vaseline or castor oil. Ice-flaps (p. 625) may be ordered. For burns caused by acids, irrigate with 2 per cent sodium bicarbonate; burns caused by alkalis, irrigate with citric acid 2 per cent solution; castor oil is instilled (p. 626) and ice-flaps are applied, the eyelids and surrounding parts are treated with gentian violet jelly. If in doubt as to the cause of the burn, irrigate with normal saline and apply castor oil drops. (For general treatment of burns see p. 521.)

Complications.—Shock, destruction of the cornea, corneal opacities, ulceration of cornea (p. 634), symblepharon (p. 642), entropion (p. 642).

Wounds.—Wounds in the eye may be caused by a variety of implements, the commonest being forks, pens, knives, and metal foreign bodies.

The *treatment* consists in washing out the conjunctival sac (p. 625) with perchloride of mercury (1–5000) after the instillation of a drop of 4 per cent cocaine if the patient is in pain or likely to squeeze the lids. In children, or where there is a large wound in the globe, this treatment is better omitted. After cleansing the lids, a clean pad and bandage is applied and the patient is kept at rest until attended to by the surgeon. After-treatment is given according to the operation undertaken.

Complications of injuries and operations.—Iritis (p. 635); sepsis; sympathetic ophthalmitis (p. 643); loss of vitreous; panophthalmitis (p. 636); meningitis (p. 374); delirium, which may be either traumatic (p. 579) or due to atropine (p. 643).

MALFORMATIONS

May be congenital or acquired.

Hypermetropia is a condition in which the eye is too short from before backwards, as a consequence rays from distant objects are focused, with the eye at rest, behind the retina instead of upon it. This condition is corrected by wearing convex or plus glasses (spherical).

Myopia is the opposite condition, the rays from distant objects being focused in front of the retina, and is a more serious condition than that of hypermetropia; it is remedied by the use of concave or minus lenses (spherical).

Astigmatism is an inequality of the cornea producing unequal refractive power of the eye. It is remedied by the use of cylindrical glasses either plus, or minus, or both according to the kind of astigmatism present. Astigmatism may be simple, that is, unattended with other refractive errors, or compound, when either hypermetropic, myopic, or mixed (a combination of the two).

Conical Cornea, a condition in which the cornea becomes cone shaped. It may occur in connection with myopia and is a serious condition. It may be treated by operation or cautery. The after-treatment is that described on p. 636.

Presbyopia.—A loss of power of focusing, due to advancing age; it is corrected by the use of convex spherical glasses for near work.

Amblyopia.—A condition of partial blindness brought about by not using the eye, for instance a squinting eye may be amblyopic from want of use.

Entropion.—A condition in which the edge of the eyelid turns inwards so that the eyelashes touch the ocular conjunctiva (conjunctiva covering the globe). It may be secondary to other conditions of the lids, or be due to contractions after burns, symblepharon, or lupus (p. 421). Operative treatment is given. In simple cases, due to having the eye padded, a narrow strip of adhesive plaster will suffice to keep the lashes turned outwards, or a strip of dry wool placed beneath the lower lid and sealed down with collodion.

Ectropion is the reverse condition and is treated by operation (p. 637).

Symblepharon, a condition in which the ocular conjunctiva becomes adherent to the palpebral conjunctiva, thus completely or partially closing the eye. It may occur as a result of burns. Operative treatment is given (p. 637).

Strabismus, or Squint.—Strabismus may affect only one eye or alternate between the two; it is termed external or internal according to the position of the squinting eye. Surgical treatment (p. 637) may be given.

Causes.—Defective muscles, error in refraction, paralysis (p. 361), disease of the brain (p. 374). The cause is treated.

Buphthalmos.—A condition in which the eyeball becomes distended with fluid. The eye becomes enlarged, vision is destroyed or impaired. Severe cases are treated by enucleation (p. 640).

Exoptosis, or Exophthalmos.—A protrusion of the eyeball, may be caused by growths, or general disease such as exophthalmic goitre (p. 297).

INFLAMMATORY CONDITIONS

Sympathetic Ophthalmitis.—An inflammation of the sound eye brought about by inflammation of the injured eye.

Treatment.—The injured eye is enucleated if blind; complete rest is given to the affected eye with hot bathing (p. 623), atropine, pad, and bandage, muff warmer or Leiter's coils (hot) (p. 624). Leeches (p. 103) or blistering may be ordered, and Novarsenobillon may be administered intravenously (p. 76). A nurse should always report any symptoms of inflammation in the sound eye when nursing patients suffering from an injured eye which has not been removed; any complaint of pain in the sound eye must be regarded as important. Unless prompt treatment is prescribed the sight of both eyes may be lost.

Glaucoma.—A disease of the eye which may be acute or chronic and is uncommon before the age of forty-five years. It is characterized by gently increased tension (p. 630) in the eyeball and if acute with intense pain, loss of sight, headache, and vomiting. Acute cases require prompt treatment or the sight is rapidly lost. One or both eyes may be affected.

Treatment.—Subacute cases are treated by rest in bed. Frequent instillation of eserine is prescribed until the tension is diminished. Acute cases and those which do not respond to treatment are treated by operation, either sclerotomy, sclerectomy (trephining), or an iridectomy.

The *after-treatment* of these cases is most important, much depends on careful nursing. The nursing is that given under cataract extraction. *Dressing* once or twice daily, pad and bandage, eserine. After sclerectomy (trephining) for glaucoma atropine is sometimes used on the third day to combat a tendency to iritis (p. 635). These patients are kept in bed a week at least, sometimes longer, and during this time they are not allowed to exert themselves in any way. Dark glasses are allowed at the end of a fortnight in favourable cases.

Atropine Delirium.—May occur in a patient who is having frequent instillations of atropine.

Symptoms.—Dry mouth, loss of appetite, sleeplessness; later, delirium which may be of the muttering type and worse at night, or it may be most violent, resembling that of delirium tremens (see delirium, p. 359). During the delirium the patient invariably sees imaginary objects, food is refused, in the worst cases the patient will not take anything by mouth. Violent cases are treated with hypodermic injections of morphia, others less acute are given bromide and chloral, either by mouth or by the rectum (p. 60). Atropine is discontinued, some other drug being substituted. The delirium subsides in one or two days after the atropine is discontinued.

Atropine Irritation is an irritable, swollen, and inflamed condition of the eyelids and surrounding skin which occurs in some patients who are intolerant of atropine. Ice-flaps (p. 625) are applied, also vaseline or some simple ointment. Atropine is discontinued, scopolamine is sometimes substituted. To prevent this condition, care should be taken when applying atropine either as drops or ointment not to allow any to touch the skin of the eyelids.

To hold an Infant for Application of Treatment.—The surgeon or nurse sits on one chair wearing a mackintosh apron, the nurse assisting sits sideways in front of him, also wearing a mackintosh apron. The nurse takes the infant on her knee and places its head between the surgeon's knees. With one hand the nurse holds the infant's hands and with the other may, if required, evert the lower lid for the surgeon. Obstreperous children should also be attended to in this position; the child should previously have its hands fastened to its side by rolling its body in a sheet (see Plate XXXVII).

CHAPTER XXI

NURSING OF DISEASES OF THE EAR, NOSE, AND THROAT

IN the nursing of these cases, in addition to the general nursing of the patient (p. 212), more detailed knowledge of the construction of the ear, nose, and throat must be acquired, otherwise the successful application of the special treatment required cannot be carried out satisfactorily.

The Application of Treatment.—Heat.—Heat may be applied by means of fomentations (p. 90), dry heat, electric thermal pad, by muff warmers (p. 624), rubber hot-water bottle, or Leiter's coil (p. 624), or electric thermal pad (p. 29).

To syringe an Ear.—Syringing may be ordered to clear the meatus of wax, or to wash away discharge. In the latter case very gentle syringing should be employed, as the drum may either be perforated or have been opened (see paracentesis, p. 655).

Requisites.—Sterilized 2-ounce glass syringe with a straight nozzle and finger flange; bowl containing the required lotion at a temperature of 99° F.; kidney-shaped receiver; mackintosh or towel; dry swabs.

Method.—Have the patient seated, or lying if necessary, with the ear to be syringed facing a good light, some surgeons prefer a nurse to use a head mirror and speculum, others forbid this method. Place the mackintosh or towel around the patient's neck and give him the receiver to hold under the ear. Fill the syringe with lotion and expel all the air. For an adult, seize the tip of the ear with the left thumb and forefinger, pull it gently outwards, upwards, and backwards to straighten the canal, and introduce the nozzle of the syringe into the entrance of the meatus. Direct the nozzle, which must be straight, not bulbous, towards the roof of the meatus, and expel the lotion from the syringe in gentle jerks, no force should be used. When syringing for wax, continue the syringing until the meatus appears clear and no more wax can be seen. When finished, direct the patient to incline his head towards the side syringed in order to empty the meatus, then dry out with a swab of wool. In the case of young children, the lobe of the ear should be drawn downwards and backwards instead of upwards.

The following rules should be borne in mind.—**Always test the** lotion and see that it is at the correct temperature, otherwise the patient may become giddy.

Never syringe an ear without instructions from a doctor.

Never apply warm oil or any drops to an ear without express orders from the surgeon; many surgeons object most strongly to the use of oil for the ear. Without express instructions never put forceps, swab, or probe into the auditory canal, or beyond the meatus.

Always keep the contents of the receiver to show the surgeon, if present. It is advisable to use a black papier-mâché receiver, as the discharge or wax can more easily be seen. In out-patient work it is a good plan to have two receivers marked R. and L. in case both ears need to be syringed; there will then be no difficulty in knowing which is which when showing them to the surgeon, the receivers containing the lotion from the right and left ears being held in the right and left hands respectively.

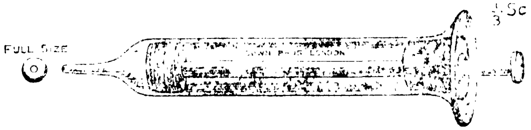


FIG. 224. Glass aural syringe.

Use a sterile glass syringe with a straight nozzle. A bulbous nozzle may obstruct the free return of the fluid and so cause pressure on the drum. Glass syringes may now be had, they are made with a loop at the end of the piston, and a deep flange at the end of the barrel, to allow of manipulation with one hand.

Lotions used for syringing.—Normal saline solution; sterilized boracic; perchloride of mercury (1–2000); carbolic (1–40); Lysol (1 per cent); soda bicarbonate (gr. x-℥j); the last is useful for syringing when inspissated wax is present.

Drops may be inserted before syringing when the meatus is blocked with hardened wax, of these the most effective are hydrogen peroxide and soda bicarbonate (gr. x-℥j). These are poured into the meatus and left in position for 5–10 minutes before syringing. Drops are frequently ordered after syringing, the most usual are boric acid (gr. 20 in spirit ℥j).

To apply drops.—Incline the patient's head so that the ear to be treated is uppermost, the head being either supported on the patient's hand with the elbow resting on his knee, or resting on the pillow or a table. Heat the drops in a glass minim measure or teaspoon, draw the ear upwards as for syringing and pour the drops in.

Politzer Bag (air douche) is a rubber bag containing air and fitted with a specially constructed nozzle for either one or both nostrils (Fig. 225).

Method.—Introduce the top of the nozzle into the nostril, hold in position by compressing both nostrils with the left hand, direct the patient to swallow a sip of water, and as he swallows, compress the bag sharply with the right hand. The air is then driven into the Eustachian tubes, and if successful, the patient will say that he felt his ears 'pop.' The patient may be instructed to blow out his cheeks instead of swallowing water; this method is often more satisfactory with children, but not so good with adults. Some surgeons insert two drops of chloroform into the bag before use.

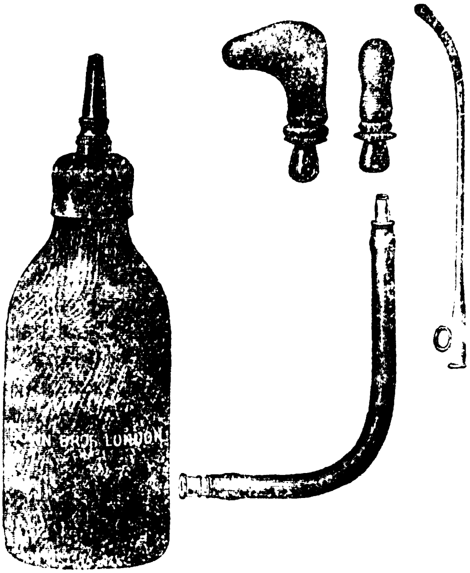


FIG. 225. Politzer's air douche, connection, nose piece and Eustachian catheter.

Cleansing the Nose.—The simplest and safest method of clearing the nose is by blowing it. This may be the only treatment ordered after some operations on the nose and is one that the nurse must teach the patient to accomplish satisfactorily. After the use of cleansing lotions, and when blood or pus requires removal, the patient inclines his head over a receiver, or soap-dish bottom, and, closing one nostril with the forefinger of the same side, he clears the opposite nostril by blowing down it, like 'the man in the street'—*à la paysanne* as it is termed in France.

When teaching children (or adults may require teaching) to blow the nose the following is the correct procedure: A full breath is taken, one nostril is closed, the expiratory air being driven down the unclosed nostril. The process is repeated with the other nostril. This expels all secretion into the handkerchief.[1]

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[1] *Diseases of the Nose and Throat,* St Clair Thomson.

The Application of Nasal Lotions.—Lotions may be irrigated, sniffed, syringed, or sprayed into the nostrils. Temperature of lotion 96°–106° F., the lotion may be used at a temperature of 96° F. and gradually increased. Lotions may be prescribed for use at a temperature of 112°–120° F., and are injected into the nostrils with a glass pipette or syringe, as the skin of the nose is more sensitive to heat than the mucous membrane.

Nasal Douche.—This may be given by means of an irrigator with a glass nozzle attached, or with a 1-ounce all-rubber pear-shaped syringe.

Method.—Have the patient seated upright with the head slightly inclined forward over a basin. Arrange a mackintosh to protect his clothing. Introduce the nozzle into the nostril pointing straight backwards, not upwards. If both nostrils are affected, the fluid is first directed along the obstructed side. Direct the patient to open the mouth and breathe in and out in a snoring manner. The fluid then tends to flow in at one nostril and out at the other. Allow the lotion to flow in gently. Swallowing movements must be avoided; if uncontrollable, the administration must be stopped. Blowing the nose as ordinarily done should be avoided. After the bulk of the fluid has escaped, or has been hawked out through the mouth, the nasal cavities are cleansed (*à la paysanne*) as just described.

Another way of washing out the nose is to use a Higginson syringe with a glass nozzle attached. The fluid should not be introduced with any force. Position of the patient and method are as described under nasal douche.

Dangers.—Driving the fluid by pressure into the Eustachian tube, thereby setting up otitis media (middle ear disease, p. 656).

Nasal Wash-out by 'Sniffing.'—Place the warm lotion in a clean shallow dish such as the bottom of a soap dish. Instruct the patient to close one nostril with one finger, and to place the nose in the lotion. He then sniffs up the fluid into his nose and spits it out of his mouth into a receiver. This is repeated with the opposite nostril closed, and continued until the nose is clean.

Lotions used.—Normal saline solution; collunarium alkalinum saccharatum; boracic lotion.

To syringe Post-nasal Space.—Attach a Eustachian catheter (Fig. 226) to a Higginson syringe. Fill the Higginson with lotion and expel the air and place it in a bowl containing the warm lotion.

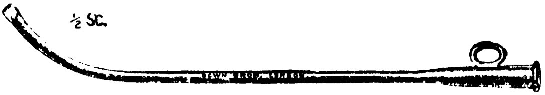


FIG. 226. Eustachian catheter

Introduce the catheter through the mouth behind the soft palate. Instruct the patient to lean the head forward over a bowl, and to keep the mouth open. Syringe the lotion in gently, making frequent pauses for breathing.

Spraying.—The *coarse spray* (Fig. 227) is a valuable method of cleansing the nose, and is free from the dangers attending the use of the douche. The liquid in the spray is warmed, the nozzle is then inserted into the nostril, and the ball rapidly compressed. The patient should incline slightly forward over a basin, and the swallowing movement should be avoided.

The *fine spray* is used for the application of small doses of fluid, such as cocaine.

Oily sprays (*atomizers*) are employed for the introduction of menthol, eucalyptus, etc., in petroleum oil, and are introduced after the nose has been cleansed.

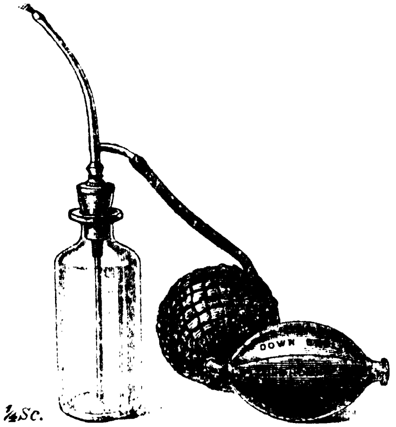


Fig. 227. Spray Atomizer.

Insufflation.—The insufflation of powders may be ordered. They are introduced by means of an insufflator (Fig. 228). The patient should cease breathing just for the moment of insufflation. A quill attached to a piece of rubber tubing makes a good insufflator, the powder is picked up in the quill and driven into the nose by blowing through the end of the rubber tube. The patient may do this for himself.

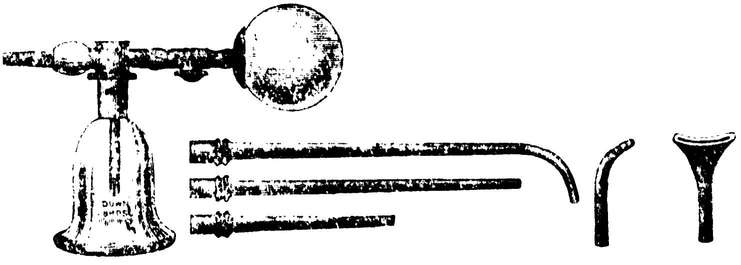


Fig. 228. Insufflator

Ointments.—Ointments may be applied on the end of a probe covered with dry cotton wool or by means of a camel-hair pencil.

Intratracheal Injections.—Fluid drugs are introduced into the larynx, trachea, etc., by means of a laryngeal syringe (Fig. 229). The treatment is not as a rule entrusted to the nurse to carry out. After warming the fluid, the syringe is filled, the air is expelled, and the end of the syringe is introduced into the larynx. A sputum cup should be in readiness in case the patient requires it.

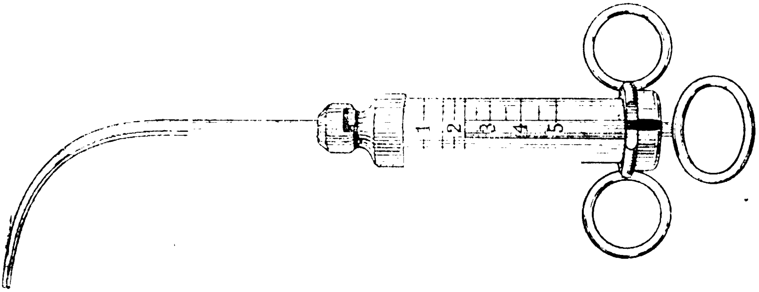


FIG. 229. Laryngeal syringe.

Gargles.—Direct the patient to take a mouthful of the lotion, then to hold the head well back, take a deep breath, and gargle for a few seconds. The fluid is then expelled, and the procedure repeated.

Throat Swabbing.—*Requisites.*—Light, tongue depressor (Fig. 235), or the handle of a spoon, swab holder or catch forceps, dry cotton wool, receiver, the application.

Method.—Have the patient in such a position that the light falls on the throat. Hold down the tongue with the tongue depressor, and gently but quickly swab the throat over with the application by means of a swab of wool firmly attached to the forceps and dipped in the application. If more than one swabbing is required, a clean swab must be used. Drugs used for swabbing: carbolic (1–40—1–60), perchloride of mercury (1–2000), iodine paint (5 per cent), glycerine and tannic acid.

To syringe a Throat.—*Requisites.*—Higginson syringe with a glass nozzle, or a 3-oz. pear-shaped syringe; bowl of warm lotion; receiver; light; tongue depressor; mackintosh; and basin.

Method.—Have the patient sitting up opposite the light with his head inclined forward over a basin. Depress the tongue and introduce the nozzle into the mouth pointing in the direction of the tonsil to be syringed. Syringe fairly briskly and allow the patient breathing space after each syringeful. The lotion should be used as hot as the patient can bear it. Lotions used: Coll. alk.

sacch., Sanitas (1–20), normal saline solution, permanganate of potash (pink).

To wash out an Antrum.—*Requisites.*—Eustachian catheter (Fig. 226), Higginson syringe, bowl of warm lotion, receiver, mackintosh.

Method.—Have the patient sitting up in front of a good light, connect the catheter to the Higginson syringe. After filling the syringe and expelling the air, introduce the tip of the catheter into the opening of the antrum, either through the nostril if opened through the nose, or through the gum if opened through the alveolus. Syringe the lotion in gently, the patient inclining his head over a basin. In cases washed out through the mouth, a small bent metal cannula is used instead of the Eustachian catheter.

INSTRUMENTS REQUIRED WHEN THE SURGEON IS TO EXAMINE OR APPLY TREATMENT TO AN EAR, NOSE, OR THROAT

Ear.—Head mirror (Fig. 230); light; aural syringe (Fig. 224); kidney-shaped receiver; aural specula (Fig. 231); aural dressing forceps; Eustachian catheter (Fig. 226); post-nasal mirror (Fig. 232);

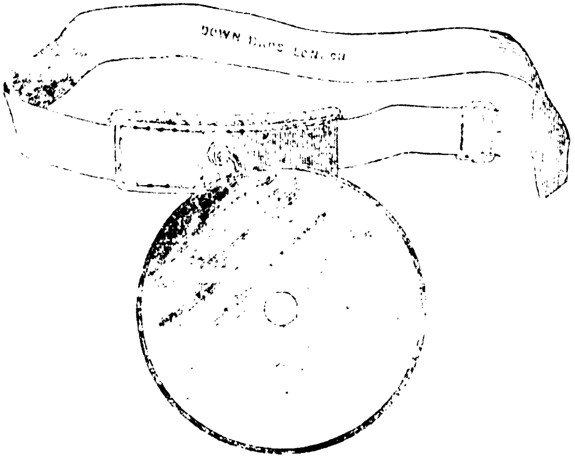


FIG. 230. Head mirror.

Siegel's speculum; tuning fork (Fig. 233); dry absorbent wool swabs; small squares of linen to use for wiping; receiver; towel and mackintosh; cocaine spray; Politzer bag (Fig. 225); auscultation tube; spirit lamp; bowl of carbolic (1–20).

Nose.—Head mirror; light; aural and nasal specula (Fig. 234); post-nasal mirror (Fig. 232); probe; nasal dressing forceps; Eustachian catheter (Fig. 226); tongue depressor (Fig. 235); cocaine spray; tuning fork (Fig. 233); Higginson syringe with glass nozzle, warm lotion; bowl and receiver; dry cotton-wool swabs; small linen squares for wiping; towel and mackintosh; spirit lamp; bowl of carbolic (1–20).

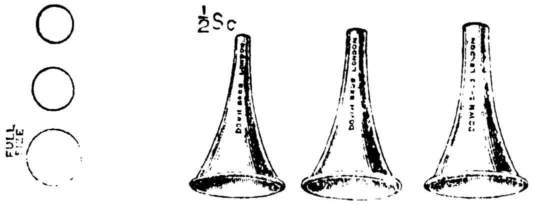


FIG. 231. Aural specula.

Throat.—Head mirror; light; tongue depressor; nasal probe; laryngeal (Fig. 236) and post-nasal mirrors; sponge forceps; cocaine spray; dry cotton-wool swabs; small linen squares for holding the tongue; bowl of carbolic (1–20); receiver; spirit lamp; towel.

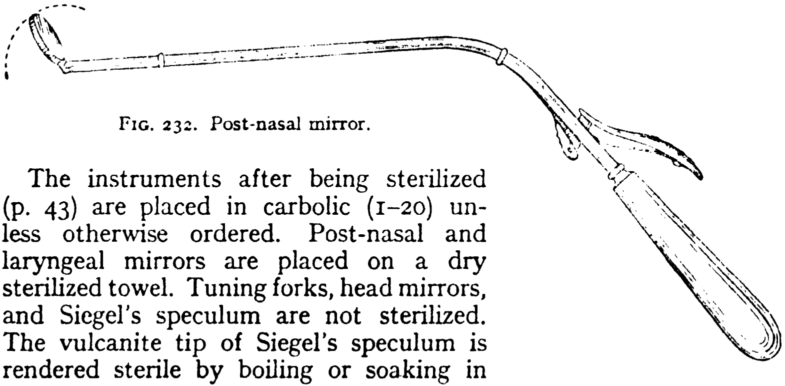


FIG. 232. Post-nasal mirror.

The instruments after being sterilized (p. 43) are placed in carbolic (1–20) unless otherwise ordered. Post-nasal and laryngeal mirrors are placed on a dry sterilized towel. Tuning forks, head mirrors, and Siegel's speculum are not sterilized. The vulcanite tip of Siegel's speculum is rendered sterile by boiling or soaking in carbolic (1–20). For dressings, in addition to the things mentioned above, the necessary dressings, lotions, bowls, and sterile towels will be required (for which see p. 438).

For Examination by Killian's or Brunning's Bronchoscope, or Oesophagoscope.—Cocaine, adrenalin, and small dish for same; dry cotton-wool swabs; receiver; head light and accumulator; bronchoscopes and wool carriers; tongue depressor.

The patient is placed either sitting upright on a chair, the head being steadied by an assistant, or lying flat on a table with the shoulders raised on a sand-bag or firm pillow, the head inclined backwards.

FIG. 233. Tuning fork.

Paraffin Injection for the Nose.—*Requisites.*—Purification apparatus (p. 437); sterile paraffin, which, when brought to the correct temperature, is placed in a sterile glass measure, standing in a bowl of hot sterile water so that the temperature is maintained; sterile syringe; dry swabs; thermometer.

The patient is seated on a chair, an assistant supporting the head and compressing the blood-vessels at the side of the nose. The chief duty of the nurse during this operation is to maintain the paraffin at the correct temperature.

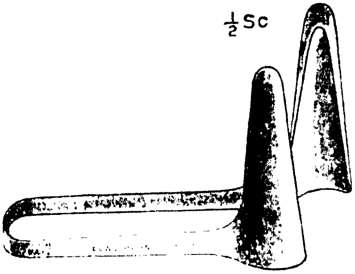


FIG. 234. Nasal speculum.

To hold a Patient's Head during Examination of the Nose or Throat.—The patient sits upright on a chair, the nurse stands immediately behind him and holds the head by grasping it on either side with the hands, the fingers towards the forehead, the

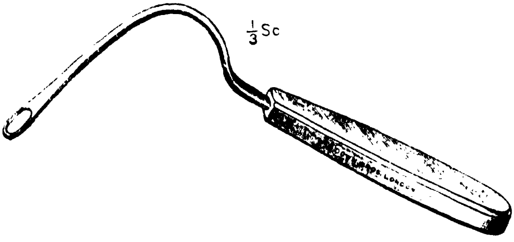


FIG. 235. Franke's tongue depressor.

palms towards the back of the head. In this way the patient is prevented from backing away from the surgeon (see Plate XXXVIIIA).

To hold a Child.—The nurse sits upright on a chair and places the child sitting on her knee. The child's back should be against the nurse's chest, the legs hanging down in front of the nurse's knees. The child's head rests on the nurse's chest or shoulder, the nurse holding it in position with her right hand placed on the forehead, the nurse's left hand holds the child's arms to its side, the nurse's legs are crossed over the child's legs. If the child is very unmanageable it is advisable to pinion its arms by rolling it in a sheet and then proceed as above (see Plate XXXVIIIB).

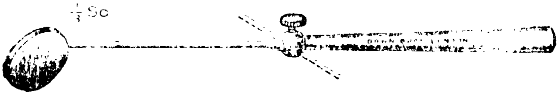


FIG. 236. Laryngeal mirror.

OPERATIONS ON THE EAR

Preparation.—Preparation for general anaesthesia (see p. 446).

Purification.—The ear is first syringed with warm boracic lotion to free it of all discharge, the auricle and surrounding parts are then carefully washed with ether soap, then carbolic (1-40), and finally perchloride of mercury (1-2000). The ear is syringed (p. 645 with warm perchloride of mercury (1-2000) and plugged with a strip of ribbon gauze wrung out of the same solution. A half-moon-shaped piece of gauze wrung out of lotion is placed around the ear covering the mastoid; a second piece, after being soaked in the same solution, is placed over the concha; the dressing is then covered with wool and bandaged (p. 134) in position. In operations to be performed through the mastoid or from behind the ear, in addition to the above purification it will be necessary to shave (p. 438) the hair around the ear for about 1½ inches or more.

General after-treatment.—The patient is kept lying down but allowed to turn on to the unaffected side. Temperature, pulse, and respiration are recorded twice daily, or every four hours in acute cases. An aperient is given on the second night, calomel is often the aperient prescribed. Liquid diet is given until the sickness stops, which may be very persistent for the first 24 hours. (For treatment of post-anaesthetic vomiting see p. 457.) The dressing is done daily or more frequently in some cases. In most cases the patient is allowed to sit up in bed at the end of three days and allowed out of bed in ten days. Slight operation cases, such as incising the drum and operations on the external ear, are only kept in bed for two to three days, slighter cases are done in the out-patient room or surgeon's consulting-room, and allowed to return home subsequently. (For general nursing, in addition to the above, of operation cases see p. 460.) Special nursing required is given under the various operations described.

Operations on the External Ear.—Operations may be undertaken for the removal of foreign bodies (p. 525), exostoses, granulations, polypi, and the incision of boils and furuncles.

Paracentesis consists in opening the drum (myringotomy) to evacuate an accumulation of fluid in the middle ear.

Middle Ear.—**Ossiculectomy** is the removal of the ossicles, or small bones, of the ear through the meatus.

Mastoid.—**Mastoidectomy.**—This operation may be confined to the removal of pus, granulations, and diseased bone from the mastoid process, leaving the auditory canal and middle ear untouched (Schwartze's operation); it is generally performed in cases of acute mastoid inflammation. Or what is known as the radical operation is performed; it consists, in addition, in the removal of the posterior bony wall of the auditory canal, the outer wall of the attic, together with any diseased tissue that is present in the middle ear. It is performed in cases of chronic suppurative disease of the mastoid process and middle ear.

After-treatment.—The dressing consists in the removal of the gauze packing, gentle syringing with the prescribed lotion, re-packing the meatus with either cyanide, plain, or iodoform ribbon gauze wrung out of the lotion, and the application of gauze, wool, and a bandage (p. 134). The surgeon does the dressing for the first few days, after which it is usually entrusted to the nurse. Later, the instillation of hydrogen peroxide drops before syringing and of boric spirit drops after syringing may be ordered.

Unfavourable symptoms.—Erratic temperature or sudden fall in temperature without a corresponding improvement in the patient's condition; abnormally slow pulse (p. 200); squint (p. 642) or double vision; forcible vomiting (p. 184) unassociated with the administration of food; drowsiness; pain; facial paralysis; rigors (p. 207); delirium (p. 359). The occurrence of any of these symptoms should be immediately reported to the surgeon.

Complications.—Cerebral abscess (p. 379); thrombosis of the lateral sinus; meningitis (p. 374); sepsis (p. 568); erysipelas (p. 581).

Cerebral and Cerebellar Abscesses, Septic Thrombosis of the Lateral Sinus.—Operations may be undertaken for the above conditions, all of which are extremely serious and very often fatal.

Preparation is that given under operations on the brain (p. 477). In addition to the purification given for the ear, it will be necessary to shave (p. 438) a much larger area around the ear, it may be necessary to shave half or the whole scalp. It is better to purify too much rather than too little in these cases.

After-treatment.—The patient is kept flat in bed, and absolutely quiet, with the head back to the light (see nursing of operations on the brain, p. 477). Temperature, pulse, and respiration are taken every four hours, or oftener.

Diet is fluid until the temperature is nearly normal and vomiting has ceased. It is then slowly increased, fish and chicken are given later, but meat is not allowed until convalescent.

After-dressing may be done daily or every second day. The patient should not be allowed to do anything for himself until the acute stage is over. As the acute stage subsides the patient is allowed to sit up in bed gradually, and later is allowed up. The bowels require careful regulation, the urine should be measured and a daily specimen tested.

Unfavourable symptoms.—Erratic temperature, sudden fall in temperature or sudden rise in temperature with fall in pulse-rate; slow pulse; squint (p. 642); conjugate deviation (p. 209); rigors (p. 207); vomiting; pain; drowsiness; delirium (p. 359); facial paralysis (p. 367); paralysis (p. 361) of either of the limbs or any part of the body; incontinence of faeces or urine.

Complications.—Meningitis (p. 374); septicaemia (p. 575); shock (p. 561); exhaustion; coma (p. 360).

DISEASES OF THE EAR

Otitis Media (Acute).—Inflammation of the middle ear.

Causes.—Catarrh; or may follow operations on the naso-pharynx and nose, or be due to disease of these parts; or follow faulty douching or syringing of the nose (p. 645), or may be a complication of debilitating diseases such as measles (p. 333), typhoid, etc. (p. 341).

Symptoms.—Earache, deafness, noises in the ear (tinnitus, p. 364).

Treatment.—Hot fomentations (p. 90) to the ear are ordered. Careful cleansing of the nose by blowing *à la paysanne* (p. 647) is essential. The external ear is purified by syringing with warm carbolic (1–40), and a gauze plug may be ordered. If fluid collects in the tympanic cavity, or its exit is inadequate, an incision is made through the drum membrane (myringotomy) (p. 655). The pain usually subsides after the fluid has been evacuated. The ear is dressed until the drum is healed. Mild cases end by resolution (p. 568) without the drum being incised. Severe cases may progress and end in suppuration (p. 838), causing ***mastoiditis*** (inflammation of the mastoid) and mastoid abscess. The latter is treated by operation (see mastoid operations, p. 655).

Complications.—Permanent deafness. Meningitis (p. 374), if suppuration occurs.

N.B.—Pain in the ear should always be reported without delay, and no treatment beyond the outward application of warm wool, or a fomentation, should ever be given without instructions from a doctor.

Chronic Catarrh of the Eustachian Tubes.—*Causes.*—Catarrh or inflammation of the lining of the Eustachian tubes. Post-nasal and nasal growths, i.e. adenoids (p. 658), polypi, etc.

Symptoms.—Deafness, noises in the ear (tinnitus).

Treatment.—The patient is not kept in bed. Treatment is given by the aural surgeon as a rule and consists in blowing air into the Eustachian tubes with either a Politzer bag (p. 647) or Eustachian catheter attached to a bellows. The nurse may be directed to use the Politzer bag. Massage of the drum is given in some cases, a Siegel's speculum is used, which may be worked by hand or electricity. Inhalations (p. 105) may be ordered. Permanent deafness may result unless the condition is relieved. Any abnormal condition of the nose or naso-pharynx is treated by operation if necessary (see adenoids, p. 658).

OPERATIONS ON THE NOSE AND NASO-PHARYNX

Minor operations on the nose are performed under cocaine anaesthesia (p. 444), the patient is not kept in bed beyond the first day. The after-treatment consists in leaving the nose alone, or in cleansing it by blowing (*à la paysanne*, p. 647), and by means of nose washes. Plugging may require to be taken out and reinserted according to instructions. The more extensive operations are performed under general anaesthesia (for preparation see p. 446). The preparation of the nose consists in purifying the external skin and hairy part of the nostrils with soap and water and perchloride of mercury (1–2000). The interior of the nose is sometimes cleansed by the use of sterilized salt or boracic lotion. The after-treatment is the usual one for operation cases (p. 460); any special points will be found under the respective operations.

Removals of Polypi, Spurs, and Diseased Portions of the Turbinals are usually performed under cocaine anaesthesia (p. 444).

Removals of Growths and Tumours are carried out under cocaine or general anaesthesia, by snare, curette, punch forceps, or by galvano-cautery.

Septum.—*Submucous resection of the septum* is undertaken for the correction of a deviated septum. The operation is performed under cocaine or general anaesthesia. The nostrils are afterwards packed with tightly rolled and vaselined cotton-wool plugs, or plugs of rubber sponge, gauze, protective or rubber finger-stall packed with wool. These are left in position for 24 hours; it is usual to remove them at the end of that time and to insert smaller ones which are removed in the course of another 24 hours. The treatment then consists in sniffing up lotion (p. 648) to keep the parts clean, and greasing the nostrils with menthol or other vaseline.

Maxillary Sinus.—Operations are undertaken to open and drain the cavity; this may be performed by drilling a hole through a tooth socket (alveolar opening), or by a large opening made through the nose or through the gum. General anaesthesia is usual. The antrum may require to be washed out daily subsequently (p. 651).

Frontal Sinus.—This may be opened and drained through the nose, or a much more serious and extensive operation may be undertaken which consists in opening the cavity and removing any necrosed tissue through an incision made along the line of the eyebrow. In the latter operation general anaesthesia is needed. The purification should include shaving the eyebrow (p. 438) and a thorough purification of that side of the face (see p. 437).

After-treatment.—The patient is kept in the recumbent position for the first three days or longer. The temperature, pulse, and expiration are taken every four hours. The dressing is done daily or every second day. The diet is liquid until the sickness stops, then light solid diet is given.

Unfavourable symptoms.—Headache, vomiting, squint, rigors (p. 207), sudden drop or rise in temperature.

Complications.—Meningitis (p. 374), sepsis (p. 568), cerebral abscess (p. 379).

Naso-pharynx.—Adenoids.—The most common operation on the naso-pharynx is that for removal of adenoids (p. 660).

General anaesthesia is employed, in many cases nitrous oxide gas is sufficient (p. 447).

After-treatment.—The patient is put to bed with the head turned to one side, or in the prone position (Plate XXVII). If no haemorrhage occurs he is allowed to sit up as soon as he has recovered from the effects of the anaesthetic. Food should be cold and fluid for the first 24 hours, then soft solid food is given. The patient may vomit a considerable amount of blood; this need cause no anxiety if it occurs once only and the blood is not bright, as it will only be the blood swallowed at the time of operation. (For character of vomit containing altered blood see p. 185.) Melaena may also be present from the same cause (p. 185). An aperient administered within 24 hours is important in order to get rid of any swallowed blood which has not been vomited. Any foetor of breath is more frequently due to gastro-intestinal infection than to any local sepsis and should be reported. Patients are allowed up after the first or second day, but should not be allowed out of doors for three days unless the weather is warm and sunny. If the windows are kept open day and night, and the child is taken out of doors as soon as advisable, it is remarkable how quick is recovery and healing. Lotion may be ordered for sniffing up, but no local treatment is prescribed as a rule. The nose is cleansed from any blood-clot by teaching the child to blow it *à la paysanne*. Later, the child is given breathing exercises (p. 752), and taught to breathe through the nose.

Complications. — Haemorrhage (p. 563), sepsis, otitis media (p. 656).

DISEASES OF THE NOSE AND NASO-PHARYNX

Sinusitis.—Inflammation of the accessory sinuses of the nose. The condition may be acute or chronic, and affect only one, several, or all the sinuses (pan-sinusitis).

The accessory sinuses comprise: Maxillary sinus; frontal sinus; anterior ethmoidal cells; posterior ethmoidal cells; sphenoidal sinus.

Causes.—Suppuration may arise primarily from direct infection of the sinus, or be secondary to some intranasal affection. Acute infections which may give rise to sinusitis are: influenza, pneumonia, measles, enteric, scarlet fever, small-pox, cerebrospinal meningitis, diphtheria, erysipelas, and more rarely, glanders, mumps, or gonorrhoea. (For infectious diseases see Chapter VIII.) Sinusitis may also follow an injury.

Symptoms.—Acute sinusitis may be (*a*) of a mild type, so that there is only slight oppression or heaviness over the affected cavity, with a discharge which is not noticed, or (*b*) of a severe form.

Acute sinusitis so frequently forms part of an acute 'cold in the head' (coryza, p. 353) that many of the symptoms are very similar, with the addition of pain in the region of the cavity, generally described as neuralgia, and tenderness on pressure. Lachrymation, photophobia (p. 631), oedema (p. 190), slight congestion, and deep-seated headache may be symptoms of the implication of a sinus. The occurrence of a rigor or a rise in temperature indicates more than a simple catarrh. Relief is obtained by a discharge of mucus, which may be blood-stained or purulent, or by a free gush of pus, sometimes very offensive both to taste and smell.

Treatment.—Rest in bed, hot moist compresses (p. 90) on the forehead of affected cheek, nasal inhalations (p. 105), antiseptic gargles and anodynes are ordered. In the subacute stage, the careful use of nose lotions (p. 648) may be prescribed. Aspirin, phenacetin, or other drugs may be ordered for the relief of pain. If the maxillary sinus is affected, any carious or suspicious teeth are attended to. Other treatment is that of catarrh. Rest, and change to a mild sunny climate, are frequently beneficial in cases which threaten to become chronic.

If this treatment is insufficient to procure drainage, operative treatment may be required or the cavities may be opened and washed out. (For operations see p. 657.)

Complications.—Meningitis; cerebral abscess; septicaemia.

Adenoids.—Hypertrophy, or abnormal growth of mucous and glandular structures in the post-nasal space, commonly called 'post-nasal growths.'

Symptoms.—The growths block up the air-way between the mouth and nose, so that the patient is apt to breathe with the mouth open; they obstruct the ends of the Eustachian tubes, so that little or no air can enter the tympanum. Snoring when asleep is a common symptom in children. If not removed, permanent deafness may result. The face assumes a heavy and vacant expression, the intellect is impaired, the chest may become misshapen, and the shoulders rounded. Anaemia (p. 283) and debility are common results.

Treatment consists in the removal of the growths by operation, described on p. 658.

OPERATIONS ON THE THROAT

Uvulectomy is the removal of the uvula.

Tonsillectomy.—Removal of the tonsils.

General anaesthesia is usual for the latter, which is commonly associated with the adenoid operation (p. 658). (For preparation for general anaesthesia see p. 446.)

After-treatment.—The patient is put to bed lying on his side, or in the prone position (p. 545). The frequency with which the patient swallows should be noted by the nurse, as this is a reliable guide as to whether concealed haemorrhage is occurring and the blood being swallowed. (For treatment of haemorrhage and collapse see p. 562.)

Cold soft food is given for the first 24 hours: jellies, ice cream, etc., then for the following three days soft solid food. An aperient is given within 24 hours, and the bowels need careful regulation subsequently. The patient is kept in bed for one or two days, but not allowed out for four days unless the weather is warm and bright. A gargle or antiseptic lozenge is often ordered.

Peritonsillar Abscess (p. 838).—The abscess is opened by means of an incision made just outside the tonsils. Cocaine anaesthesia may be required, or no anaesthetic may be used.

After-treatment.—Temperature, pulse, and respiration should be taken twice a day or every 4 hours if necessary. Liquid or pulpy diet is given until the patient is able to swallow with comfort, followed by a generous diet (soft), the patient being made to feed up. Tonics are usually prescribed. Attention to the bowels is important, a saline aperient may be given every morning if indicated.

Local treatment consists in gargling (p. 650), syringing the throat with warm lotion (p. 650), swabbing the throat may also be ordered (p. 650). The patient is kept in bed until the temperature is normal and the throat is no longer swollen. Fomentations (p. 90) may be ordered to the neck if there is much pain.

Retro-pharyngeal Abscess.—A collection of pus between the posterior pharyngeal wall and the cervical vertebrae. The abscess is opened either through the mouth or through the neck according to the position in which it points. If opened through the neck, the nursing is that described under abscess. When opened through the mouth no anaesthetic is administered. Everything required for an immediate tracheotomy (p. 662) should be at hand. The infant is swaddled in a blanket or shawl so as completely to control the movements of the extremities, and is then laid on its side without a pillow, and held by the nurse or some trustworthy assistant, with the head low and the face directed somewhat downwards. After the abscess is opened, the pus will pour out of the nose and mouth.

After-treatment.—The child is put to bed with the head lower than the body, and turned to one side, or in the prone position (p. 545), so that any discharge will run out of the mouth instead of into the larynx or lung.

The diet is liquid until the child is able to swallow with comfort. These children are often in a debilitated condition, and need good nursing, fresh air, and nourishing food. Local treatment consists, in keeping the mouth and nose clean. With infants this is best accomplished by swabbing carefully. In adults or older children the after-treatment is that given under peritonsillar abscess (p. 661).

Laryngotomy consists in incising and introducing a tube (Fig. 237) into the larynx. It is usually a temporary measure only, and may be performed in urgent cases of laryngeal stenosis or as a preliminary in operations of the air passages.

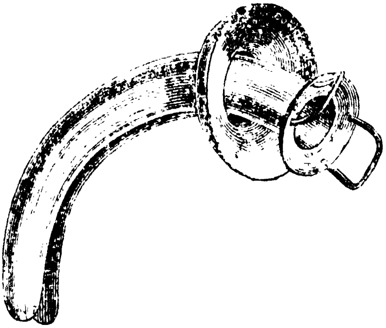


FIG. 237. Laryngotomy tube.

Tracheotomy consists of an opening made into the trachea, and the insertion of a tube through which respiration is carried on. It is termed 'high' tracheotomy when the incision is made above the isthmus of the thyroid, 'low' tracheotomy when below. Undertaken for various forms of laryngeal and tracheal obstruction, such as membranous deposit in diphtheria (p. 349), adhesions between the vocal cords, oedema of the glottis (p. 668), growths about the glottis, papilloma, stricture, paralysis of the abductor muscles of the cords, foreign bodies (p. 526) in the trachea, and as a preliminary to some operations. (See operations on the mouth, p. 479.)

Preparation.—The operation may be performed under general anaesthesia (p. 446), cocaine anaesthesia (p. 444), or without any anaesthetic if the patient is unconscious (p. 544).

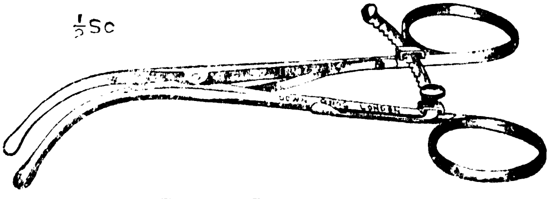


FIG. 238. Tracheal dilator.

Purification.—The skin is purified in the usual way (p. 437).

Requisites.—Firm table, sand-bag, hard pillow; mackintoshes, sterilized towels; swabs; bowls; lotions; receiver. Instruments: scalpel, two sharp hooks, retractors, tenaculum, tracheal dilator (Fig. 238), Spencer-Wells artery forceps, tracheotomy tubes (Fig.

239) of various sizes threaded with tape (p. 665), introducers or pilots, scissors, 2 pairs of dissecting forceps, needles and sutures, dressings.

After-treatment.—The tube having been inserted into the trachea, it is retained in position by passing the tapes round the neck and tying them at the side, but not so tight as to cause any constriction. The wound is dressed with sterilized cambric or boric lint thickly spread with sterilized boric ointment, and slit so as to allow of its being hitched in below the shield of the tube (Fig. 242) which thus keeps it in place. A handful of loose gauze is placed around the orifice of the tube and changed whenever it becomes soiled. The veil is next applied, and consists of a double fold of gauze suspended over a piece of tape which is fastened round the patient's neck above the tube in such a way that the gauze hangs over the orifice of the tube. The edges of the patient's gown are turned in so as to form a V-shaped opening. If necessary the chest should be covered with cotton wool beneath the gown. The edges of the gown around the tube are lined with lint and secured at the points with safety-pins (Fig. 240); this prevents the gown becoming soiled, the lint being changed as often as necessary.

The following articles are kept in readiness on a table beside the bed: Bowl of boracic lotion, bowl containing bicarbonate of soda solution (1–3), bowl of Dettol (4 per cent) for the nurse's hands, sterilized feathers, dressings, pieces of gauze in a covered jar, 1 pair dressing scissors, 3 pairs Spencer-Wells forceps, 1 pair nasal dressing forceps or sinus forceps, 2 pairs dissecting forceps, pilot, dilators, sand-bag, receiver for soiled swabs.

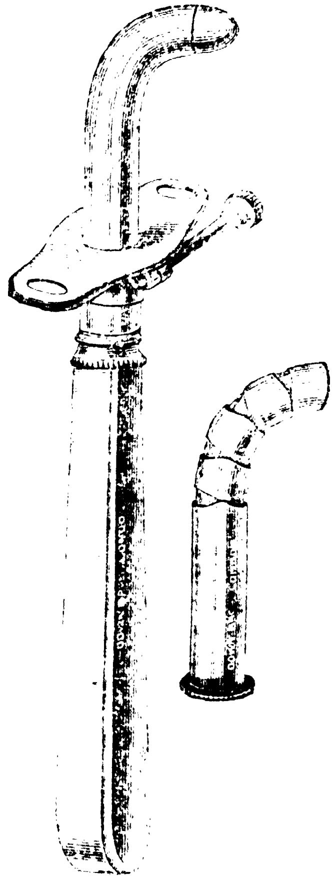


FIG. 239. Durham tracheotomy tube with inner (lobster tail) tube and pilot.

The instruments after being sterilized may be kept in a covered dish containing spirit, or they may be kept in a sterilized wool covering. The nurse's chief duty consists in keeping the wound clean, and the tube clean and clear so that air may pass freely in and out without becoming contaminated. Each time the patient coughs the nurse must be ready with a piece of clean gauze to receive the mucus and so prevent it from being sucked back. The inner tube needs to be kept scrupulously clean. If the inner tube becomes clogged it is removed and cleansed by washing in the boracic, then in the soda solution, and replaced after cleansing the other tube by passing a feather soaked in the soda solution round it to clear away any mucus. The inner tube should be sterilized by boiling every 4 hours or oftener in infectious cases. The dressing under the plate should be changed 4-hourly and the gauze, around and over the tube, when necessary. Dissecting or dressing forceps should always be used when possible instead of fingers: for instance, in drawing the dressing under the plate it should be held in forceps, the catch of a Parker tube should be turned with forceps; in this way no pressure is put on the tube or the trachea, and spasms of coughing are avoided.

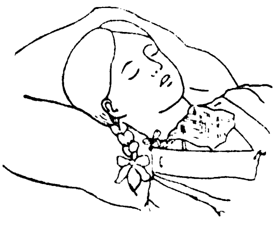


FIG. 240. The veil applied over the tracheotomy tube and method of arranging the gown.

The outer tube is changed by the surgeon, usually at varying times; a second tube should be in readiness, sterilized, threaded, with the inner tube out, and the pilot in position. When changing the outer tube the patient is put flat in bed with a sand-bag under the shoulders and the head inclined backwards.

Diet.—Liquid diet is given for several days until the patient has become used to the tube. It may be given through a spouted feeder with a rubber tube attached (p. 55), or by spoon (p. 54); if possible the patient should be propped up. In cases where there is difficulty in swallowing, as in some cases of diphtheria, rectal or nasal feeding will be required for a few days (p. 55).

Temperature, pulse, and respiration are recorded every 4 hours.

Treatment is given for the condition which necessitated the tracheotomy. Very few patients are nowadays placed in a steam tent after the operation, it being quite unnecessary in the majority of cases. The patient should be protected from draught, the room kept at an even temperature, and plenty of fresh air admitted. (For steam tent see p. 105.)

Points to be borne in mind.—When the patient coughs the nurse should steady the tube in case it is coughed out. Should the tube be coughed out, the nurse must introduce the dilators, and keep the edges of the trachea separated until help is forthcoming. When introducing dilators (Fig. 238) always introduce them with the points closed, that is, with the handles apart, introduce from the side, not the front of the wound, and bring the handles down to the front before opening them. The patient should be laid flat, with a pillow or sand-bag under the shoulders, to facilitate introduction.

Should the patient complain of discomfort and difficulty in breathing, or appear in difficulty, and yet the tube be quite clean and free, it is probable that the extremity of the cannula has slipped out of the trachea; if this is the case, it will be seen that air is not passing in and out freely. This must be reported immediately, and should the dyspnoea increase, the outer tube should be removed, and the dilators inserted until help is procured. Above all the nurse must be calm, cool, and collected, and reassure the patient. Delay in doing the right thing may prove fatal, and loss of confidence on the part of the patient will make the task much more difficult.

To thread a tube.—Narrow white tape from ¼–½ inch wide, according to the size of the tube, is needed. The length of the tapes varies according to which method of securing the tube is adopted. If it is simply tied round the neck, the tapes should be about 8 and 16 inches respectively. If the other method is adopted, they should be about 36 and 30 inches. The tapes should always be of such a length that they are tied at the side, not at the back of the neck. A small slit is made about 1 inch from the end of the tape, by folding and nicking it with a pair of scissors (Fig. 241). This end is threaded through the opening in the plate, and the loose end is then drawn through the slit in the tape as far as it will go, the other side is threaded in the same way. The tapes are then fastened around the patient's neck (Fig. 242), or if the long tapes are used, they are brought down under either axilla, crossed over the back, then drawn through the loop on the plate, and finally carried round the neck and fastened at the side of the neck. This is considered a safer plan for children and out-patients who have had a low tracheotomy done (see Fig. 243). When preparing a tube the nurse should observe the following points: See that the inner cannula fits the outer tube accurately, and that the pilot fits the outer tube; that all the fastenings and screws on the plate work

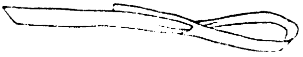


FIG. 241. Method of slitting the tape to attach to the tracheotomy tube.

easily and smoothly; that in jointed tubes, such as Durham, all the joints are intact; that the tube has not worn thin (this may be detected by small vertical cracks) or become sharp at the lower end; that the tapes are securely attached.

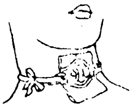


FIG. 242. The tracheotomy tube in position, fastened around the patient's neck. Note the dressing under the plate.

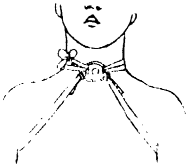


FIG. 243. Method of securing a tracheotomy tube after a low tracheotomy.

Intubation consists in introducing a tube through the mouth into the larynx. Performed in cases of stenosis of the larynx or obstruction to respiration. It is most often used for children.

The child is held on the knee as described on p. 653. After the tube is introduced the silk attached to the tube is fastened in position in front of the ear by means of a small piece of adhesive plaster. The child is fed in the special manner (Wolfenden's position, described on p. 54), or the patient should lie with the head lower than the body; this may be arranged by raising the foot of the bed on blocks. Some surgeons allow fluids to be taken in the usual manner, but the tube is not likely to keep clean for so long. In any case the patient should be made to finish by drinking water and so prevent particles of milk clinging near the tube. In some cases nasal feeding (p. 55) is ordered.

The tube is removed (extubation) by the surgeon, the child being held in the same position as for intubation. Should the tube be coughed out, the nurse must inform the surgeon immediately, but must not attempt to replace unless ordered to do so. The patient will probably be able to breathe for some time after coughing up the tube. Offensive breath is an indication that the tube requires changing, and should be reported to the surgeon.

Any symptoms of dyspnoea, cyanosis, or obstruction to the breathing must be reported immediately, and should they become urgent and the child appear to be suffocating, the tubes should be removed pending the surgeon's arrival and artificial respiration performed if necessary (p. 549).

Complications.—Aspiration pneumonia (p. 254); asphyxia if the tube is coughed up and cannot be replaced in time, or if the tube becomes clogged and is not removed.

Laryngectomy.—A partial or complete removal of the larynx. It is undertaken for malignant disease (p. 314). It is always a most serious operation involving great risk.

Preparation for general anaesthesia (p. 446).

Purification (p. 437).

After-treatment.—Some surgeons like the patient to be in a sitting posture, propped against a bedrest. By others the patient is kept flat in bed with the head much lower than the body so that any exudation will tend to run out of the mouth instead of into the lung. In partial extirpation the patient lies on the side that has been removed so that it may drain more easily. A tracheotomy (p. 662) is performed before the operation and the tube may or may not be left in subsequently.

Food is administered by the rectum (p. 58), or by oesophageal tube (p. 54), for the first four to seven days, or longer. The mouth requires constant swabbing out to keep it free from discharge. The dressing is changed as often as necessary. Talking is forbidden, a writing tablet and pencil must be provided. Fluid is allowed to be given by the mouth when the patient is able to swallow it without any appearing on the dressing. Sterile water should be given at first, and with the head lower than the body. The patient can sometimes drink when lying on the face, with the head hanging over the side of the bed, even when in other attitudes swallowing is impossible. Or swallowing may be facilitated if the patient lies well over on his face and sucks up the liquid through a glass tube (see Wolfenden's position, p. 54). Stimulants are usually ordered and as much nourishment as can be taken. The bowels need careful regulation. The temperature, pulse, and respiration are taken every 4 hours until normal, then twice a day. (For further general nursing see p. 460.)

Unfavourable symptoms.—Cough; increase in pulse and respiration rate; rise of temperature above 101° F.; dyspnoea; cyanosis.

Complications.—Aspiration pneumonia (p. 254); shock (p. 561); exhaustion.

COMPLICATIONS OF OPERATIONS ON THE NOSE AND THROAT

Haemorrhage from the Nose.—*Post-operative.*—Raise the patient's head and shoulders on a bedrest. Apply lint wrung out of iced water or equal parts of spirit and water to the bridge of the nose. If the plugs have been expelled, gauze soaked in peroxide of hydrogen may be introduced into either nostril, then pinch the nose together. Give ice to suck. This will usually suffice, but if not, a tampon will probably be introduced through the naso-pharynx by means of a Belloc's sound or a rubber catheter; this will be done by the surgeon.

In *spontaneous epistaxis*, raise the patient's head if possible, apply iced water to the bridge of the nose, pinch the nose for a time, and give ice to suck. Admit plenty of fresh air and instruct the patient to take deep breaths. In cases that may not sit up, keep them lying flat, turned on the side, raise the head of the bed on blocks, and apply the same treatment.

Haemorrhage from the Throat most commonly occurs after the removal of tonsils and adenoids (p. 660). If the bleeding is slight, prop the patient sitting up, give ice to suck, admit plenty of fresh air and direct the patient to take deep breaths and to avoid swallowing. In more severe cases, keep the patient recumbent, give ice to suck. Send for the surgeon. Swab the bleeding surface if possible with hydrogen peroxide. If the bleeding still continues from a tonsil, apply direct pressure to the tonsil with a gauze swab secured on sponge holders and a corresponding iced swab to the neck outside, making counter-pressure. If due to tags left behind, the surgeon will remove them with scissors. Calcium lactate by rectum (p. 60), morphia hypodermically, may be ordered and the bleeding surface swabbed with adrenalin. If unsuccessful, the surgeon may stitch a gauze pledget into the tonsillar socket. The number of times the patient swallows must be observed as a guide as to whether bleeding is less. The patient is told to avoid swallowing as much as possible. In some cases there may be no indication of haemorrhage beyond the frequent swallows, until the patient becomes pale, collapsed, with an increased pulse-rate and restlessness (see concealed haemorrhage, p. 511). (For the general treatment of haemorrhage see p. 563.)

Oedema of the Glottis is a serious condition which arises suddenly after operations on the throat or mouth, or from inflammation of the throat (p. 669).

Symptoms.—Difficulty in breathing, cyanosis or pallor, restlessness.

Treatment.—Report at once to the physician or surgeon. Immediate tracheotomy (p. 662) or intubation (p. 666) may be performed. The cause is treated. Until the arrival of the surgeon the nurse should prop the patient sitting up, admit plenty of fresh air, and calm and reassure him as much as possible.

DISEASES OF THE THROAT

Ludwig's Angina.—A disease due to infection, producing rapid swelling and oedema (p. 190) below the chin in front of the neck.

Symptoms.—Rise of temperature with rapid swelling of the chin and neck.

Treatment.—Prompt free incisions are made into the cellular tissue beneath the chin.

After-treatment.—Fomentations (p. 90) are ordered. Temperature, pulse, and respiration are taken every 4 hours. Stimulants are prescribed. Plenty of nourishing food in the liquid form is given until the condition improves, then semi-solid, and later solid food. The patient must not be allowed to exert himself in any way until the surgeon gives permission. Very careful nursing is required (for general nursing see p. 460).

Complications.—Laryngeal obstruction, septicaemia (p. 575), exhaustion, sudden heart failure.

Laryngitis.—An inflammation of the larynx.

Causes.—Catarrh, or may be due to diseases such as tuberculosis (p. 318), syphilis (p. 322), diphtheria (p. 349).

Symptoms.—Cough (p. 208), hoarseness, loss of voice, pain or difficulty in swallowing, obstructed respiration.

Treatment.—The patient is kept in bed in a room at an even temperature. Steam inhalations (p. 105) are ordered. Drugs are prescribed for the relief of the cough. Talking should be forbidden until the voice is regained. Soft nourishing diet is given. Temperature, pulse, and respiration are taken every 4 hours in severe cases. The patient must be carefully watched for signs of increasing dyspnoea (p. 205), and, should it occur, the nurse must immediately report to the physician, as tracheotomy (p. 662) or intubation (p. 666) may be required. If due to other diseases than catarrh, treatment for the disease is prescribed.

Complications.—Permanent injury to the voice, especially in the case of singers. Obstructed respiration.

Croup.—See p. 603.

Tonsils.—Follicular Tonsillitis.—Inflammation of the tonsils.

Causes.—Cold, wet, debility, impure atmosphere are predisposing causes. The disease is directly due to microbes, and is sometimes epidemic (p. 330).

Symptoms.—The onset is sudden with shivering, fever (p. 195), pains in the head and back, and sore throat. The sides of the neck are painful and swollen. The tongue is coated, the tonsils are red and swollen and covered by a yellowish secretion.

Treatment.—Rest in bed, a purge (usually calomel) followed by a saline draught is ordered.

Diet.—Abundant liquid food is given at first; later, soft solid food. The food should be given either hot or cold, whichever the patient finds the easier to swallow. Fomentations (p. 90) to the neck, and the throat is either syringed (p. 650) with an alkaline lotion as warm as can be borne, or swabbed (p. 650) every four hours with carbolic (1–60) or perchloride of mercury (1–2000). Lozenges containing 500 units of penicillin may be used in conjunction with one of the sulphonamide drugs described on p. 841.

The disease usually subsides in about five days, and the patient is allowed up at the end of a week if the temperature is normal. To complete convalescence a tonic is prescribed, and a change of air is desirable.

Acute Parenchymatous Tonsillitis (Quinsy).—*Symptoms* resemble those of follicular tonsillitis only they are more severe. There is great pain and difficulty in swallowing (dysphagia), the pain may radiate to the ear. The general prostration is considerable. One tonsil usually suffers before the other, it is red, tender, and swollen. There is tenderness at the angle of the jaw and difficulty in opening the mouth. The temperature may exceed 104° F. The disease usually subsides after five days by resolution (p. 568), or suppuration (p. 569) may take place. (Peritonsillar abscess, p. 661.)

Treatment.—A purge is prescribed (calomel followed by a saline draught). Salicylate of sodium, or aspirin, may be ordered, also stimulants in some cases. Food is administered in the liquid form and at short intervals. In very severe cases with much swelling, food may have to be given by the rectum. Hot fomentations (p. 90) are applied to the neck, and the throat is syringed (p. 650) with an alkaline lotion or saline solution as hot as can be borne. If suppuration takes place, the abscess will be opened (p. 464), or it may burst spontaneously. The nurse must watch for signs of obstructed respiration, and should they occur must report immediately to the physician, as in some acute cases the swelling progresses very rapidly, and in children may cause suffocation unless relieved.

During convalescence a tonic is prescribed. The throat is syringed until the tonsil heals. A change of air is advisable. Recurrence is not uncommon.

Possible complications.—Septicaemia (p. 575), pyaemia (p. 576), broncho-pneumonia (p. 254), thrombosis (p. 281), secondary oedema of the glottis (p. 668), secondary haemorrhage (p. 564), and acute oedema of the lungs of sudden onset.

CHAPTER XXII

GYNAECOLOGICAL NURSING

Anatomy of the Female Organs of Generation

The internal generative organs consist of the uterus, with its appendages, the Fallopian tubes and ovaries, and the vagina. These structures occupy a central position in the bony pelvis, with the bladder in front and the rectum behind.

The **Uterus** is a hollow, pear-shaped, muscular organ, about 3 inches long, 2 inches wide at its broadest part, and 1 inch thick from before backwards. For purposes of description it is divided into two parts: (1) the *body*, (2) the *cervix* or neck. The cervix is the lower narrower part of the uterus, and its canal is continuous with the cavity of the uterine body above, and opens through its conical-shaped lower end into the vagina below. The uterine cavity is triangular in shape and is lined with mucous membrane which is continuous with that lining the Fallopian tubes. The upper portion of the body of the uterus is called the *fundus*. At the junction of the body and cervix is a muscular constriction called the *os internum* (internal mouth); the opening at the tip of the cervix into the vagina is the *os externum* (external mouth).

The **Vagina** is a muscular dilatable canal which extends upwards and backwards from the vulva to the uterus.

The **Fallopian Tubes** are canals with muscular walls extending from the uterus on either side near its base or fundus. They pass outwards, enclosed in the folds of peritoneum which form the broad ligaments, and open through their fringed outer ends into the abdominal cavity.

The **Broad Ligaments** are extensions outwards to the pelvic wall, of the folds of peritoneum which cover the anterior and posterior surfaces of the uterus, and with other ligaments help to maintain it in its proper position.

The **Ovaries** are two olive-shaped bodies about 1½ inches in length, and lie one on each side below and behind the tubes, being attached to the posterior layer of the broad ligament without being covered by the peritoneum which forms that layer. The ovary may be called the essential organ of reproduction in the woman, since its function is to produce the female germ-cells or ova, which, when fertilized by the male germ-cell or spermatozoon, forms the embryo from which a new human organism is developed.

The **External Organs of Generation** are collectively called the vulva (Fig. 244). The vulva include the following: 1. Mons Veneris. 2. Labia majora. 3. Labia minora, or nymphae. 4. Clitoris. 5. Vestibule. 6. Meatus urinarius. 7. Orifice of the vagina. 8. Fossa navicularis. 9. Perinaeum. 10. Hymen. 11 Anus.

(1) The *mons Veneris* is the name given to the thickened pad of skin and subcutaneous fat which lies over the pubes. It divides below into the (2) *labia majora*, two skin-covered folds which pass downwards to the perinaeum, usually concealing the other structures of the vulva. The *labia minora* or nymphae (3) are folds of finer, softer, moist skin which lie within the labia majora, the upper ends uniting over a fleshy nodule called the *clitoris* (4), the lower being lost in a crescentic fold called the *fourchette*. The nymphae when separated are seen in front to enclose a triangular space called the *vestibule* (5), at the base of which is the opening of the *urethra* (6) or meatus urinarius. Below this is the orifice of the *vagina* (7), partly closed posteriorly in the virgin by a crescentic fold called the *hymen* (10). Between the hymen and the fourchette is a shallow depression, the *fossa navicularis* (8), into which the ducts of the small glands of Bartholin open. The skin-covered area between the fourchette and the anus (11) is called the *perinaeum* (9).

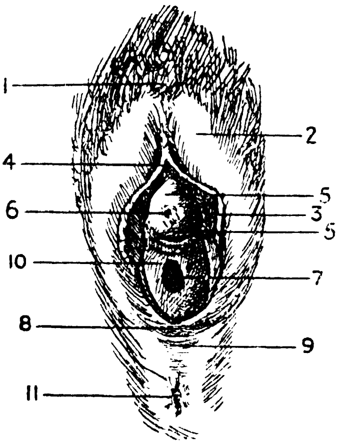


FIG. 244. The vulva, or female external organs of generation.

Preparation for examination of a patient.—To prepare a patient for examination by the gynaecologist, the external genitals should be cleansed with warm water and soap. The bladder and rectum must also be emptied. As the uterus lies in the pelvis with the bladder in front and the rectum behind, it is evident that a satisfactory examination cannot be made unless these organs are empty. If possible, an aperient should be given over-night, followed by a simple enema (p. 62) in the morning. In an emergency it may only be possible to clear the lower bowel with an enema, and in cases of sudden acute illness this should not be done until the doctor has seen the patient. The patient is asked to pass urine just before the examination, and a specimen of urine is put up for examination.

No vaginal douche should be given before examination unless ordered, as it washes away discharge, the character of which it may be important to observe. If the patient is menstruating, the examination is postponed unless undertaken for haemorrhage, or other urgent causes. The nurse should therefore always report this before the time for examination. The majority of cases are examined without an anaesthetic, but in the case of young girls or unmarried women, where a vaginal examination is necessary, it is often desirable to give an anaesthetic. These patients are prepared for general anaesthesia (p. 446). If the examination takes place in the patient's house, she should be in bed; if in hospital, or at the doctor's house, privacy may be ensured by means of screens. If the patient comes dressed to the place of examination, all waist belts must be loosened and the corsets removed, so that the breasts and abdomen may be easily examined. It is more comfortable to the patient, and less inconvenient to all concerned, if the patient is dressed in a loose vest, or combinations, stockings, and a dressing-gown. If the patient is examined on a couch or bed, a footstool must be in readiness in case the gynaecologist wishes to kneel. Should the gynaecologist wish to examine the patient on a table, and no gynaecological table be at hand, the nurse may prepare a substitute as follows: Procure a narrow wooden table upon which a thick rug or blanket is folded, over this a mackintosh covered with a sheet. One or more pillows will be required for the head, an extra sheet for covering the patient, a small blanket for covering her chest, and some towels. A stool must be provided to enable the patient to get on to the table and two chairs of suitable height should be arranged for her feet. A chair will be required for the examiner.

The following things must be prepared: A basin of hot water (with a further supply at hand), soap, a nail brush, and clean towels should be on a table for the doctor's hands, also a bowl containing a warm antiseptic lotion. Perchloride or biniodide of mercury (1–2000), or Lysol (1 per cent), or carbolic (1–40), or other lotion according to the choice of the doctor.

A small table covered with a clean towel should be placed near the bed or couch, and on it the following things are arranged: (1) Two clean towels; (2) a lubricant, either sterilized vaseline or glycerine; (3) a small piece of soap in a dish, the soap previously being softened in warm water, it is used in examining by the rectum; (4) a pair of sterilized rubber gloves, either dry, or in a bowl of warm lotion as preferred by the doctor, if gloves are not used a rubber finger stall with a cape (Fig. 20) should be in readiness; (5) a bowl of warm lotion; an empty bowl to receive the soiled swabs; (6) absorbent wool swabs; (7) tape measure.

The following instruments after sterilization (p. 43) are placed in a dish of warm sterilized water or lotion, with the exception of the Playfair probes which require to be dressed (p. 675) and kept dry and sterile until used: Vaginal speculum, vulsellum forceps, uterine sound, long blunt-pointed scissors, sponge forceps, Playfair's probes. A douche should always be in readiness in case it is needed, also a No. 8 Jacques's catheter and a glass catheter (Fig. 24). If treatment is given, in addition to the swabs it will be necessary to have vaginal tampons (p. 687), plugs, roll of gauze, and pessaries (p. 685) at hand.

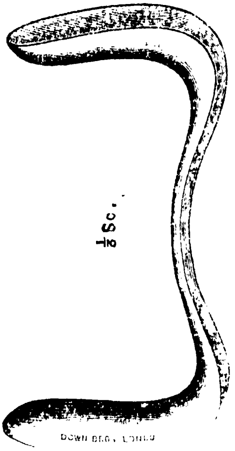


FIG. 245. Sims's duckbill vaginal speculum.

Vaginal specula.—Those commonly used are Sims's duckbill speculum, or Fergusson's cylindrical speculum. Sims's duckbill speculum consists of two concavo-convex metal ends connected nearly at right angles by a handle of the same material (Fig. 245). Fergusson's cylindrical specula are made in different sizes and of various materials—porcelain, nickel-plated steel, celluloid, glass (Fig. 246). Before handing a speculum it must be warmed by placing in a bowl of hot water. It should be lubricated if required. A duckbill speculum must only be lubricated on its convex or outer surface.

The *vulsellum* is a pair of long curved catch forceps, the ends being fitted with teeth which fit into each other when closed. It is used to grasp the cervix to draw it nearer to the vulva, to test its mobility, or to steady it when treatment is applied.

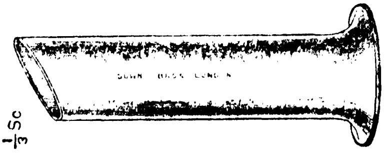


FIG. 246. Fergusson's vaginal speculum.

The *sound* (Fig. 247) is a pliable metal rod of silver, platinum, or steel. It has a flattened handle at one end which is marked in notches 3½, 4½, 5½ inches from the point.

Sponge holders (Fig. 248), after boiling, are prepared with small swabs, so grasped that the ends of the holders or forceps are at least ½ inch from the end of the swab.

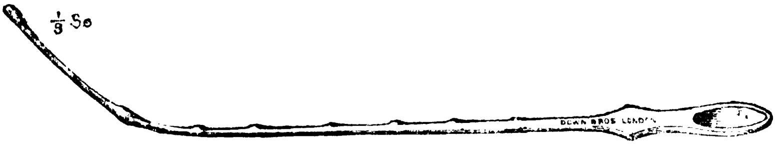


FIG. 247. Uterine sound.

Playfair's probes (Fig. 249) are long rods, the last inch or so is roughened for coating with cotton wool or gauze. When sterilized they are dressed in the following way: A very thin layer of wool, 2½ by 1½ inches, is laid on the fingers and the probe is firmly rolled in the wool between the thumb and fingers. When finished the wool should project ¼ inch beyond the end of the probe, and be so tightly applied that it cannot slip off and be left in the vagina. When dressed, the probes and sponge-holders are kept dry and sterile until required. Steel and plated instruments must not be dipped in perchloride of mercury, or they will become stained and spoilt.

FIG. 248. Sponge holder.

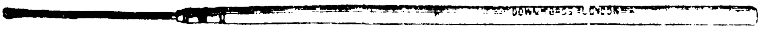


FIG. 249. Playfair's probe.

METHODS OF EXAMINATION

(*a*) **Abdominal Examination.**—The nurse should go to the left side of the bed, lay the patient comfortably on her back, the knees flexed or not as ordered, and the shoulders slightly raised, to secure the greatest possible relaxation of the abdominal muscles. Neatly turn down all the bedclothes, except the sheet, to the knees, fold up the nightdress under the sheet. Cover the chest with a warm cot blanket, nightingale, or shawl, and turn the sheet down to the pubes. The abdomen must be bare from waist to pubes, but care should be taken that the patient is not submitted to unnecessary exposure or chill. The nurse should have previously seen that the abdomen and umbilicus are clean.

(*b*) **Vaginal Examinations.**—Various positions are used for this examination, each of which has some special advantage. The nurse should be familiar with them all, and able to arrange the patient quickly and comfortably in the required position. In each case suitable covering should be provided for the upper part of the body, either a small blanket or shawl. It is often a comfort to patients if they are provided with a clean towel for covering their faces.

1. **The Dorsal Position** (Fig. 250).—The advantage of this position is that the patient is scarcely disturbed at all for abdominal, vaginal,

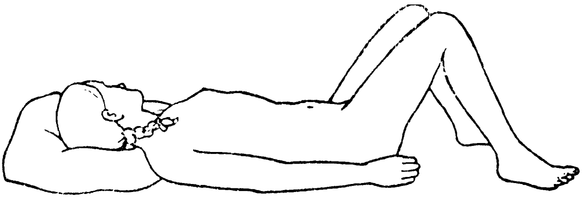


FIG. 250. The dorsal position.

and the combined bi-manual methods. If the examination is made in bed, the sheet remains as for abdominal examination, but the thighs are rather more flexed and the knees slightly separated. If inspection is not required, the examination will be made entirely under the sheet, the nurse raising the sheet when the gynaecologist is ready to pass his hand beneath the patient's right thigh for vaginal examination. If the examination is on the table, the buttocks are drawn to the edge of the table with the feet resting on chairs of such a height that the thighs are slightly flexed. The front border of the dressing-gown (when one is worn) is folded over the patient's thighs on either side, falling between them, and a sheet covers her from the waist downwards. At the time of examination the sheet can be gathered up between the thighs to allow of inspection of the vulva, or to fall over the examining hand. Other methods used for keeping the legs in position are as follows: They may be arranged in stirrups attached to the examining table, or they may be held in position by a nurse or assistant on either side.

2. **The Left Lateral Position** (Fig. 251).—The patient lies upon her left side, the buttocks are brought to the edge of the bed, and the thighs and knees are flexed. The patient is covered with a sheet which is turned back to expose the vaginal orifice. A cot blanket, nightingale, or shawl is arranged over the chest.

Bi-manual examination.—The patient is turned on to her back to allow the surgeon to palpate the abdomen during the vaginal examination.

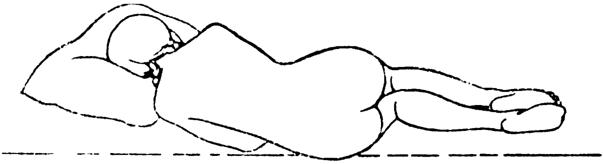


FIG. 251. The left lateral position.

3. **Sims's Position** (Fig. 252) is an exaggeration of the left lateral. The patient lies in a more prone attitude, with the chest and head resting on a low pillow and the left arm lying behind the back, or hanging over the edge of the table or bed. Its advantages are that it allows a very complete inspection of the vulva, and also enables a speculum to be used with ease. In this position of the body the abdominal contents fall away from the pelvic viscera; the vagina, therefore, more easily fills with air when its posterior wall is retracted, and allows an excellent view of the cervix. The nurse may be required to hold the speculum; for this purpose she should stand on the right side of the bed or table, with her back towards the patient's head. She should hold the speculum with her right hand and with the left raise the patient's right buttock. Care must be taken to hold the speculum exactly as directed by the surgeon. A towel should be placed over the sheet under the left buttock.

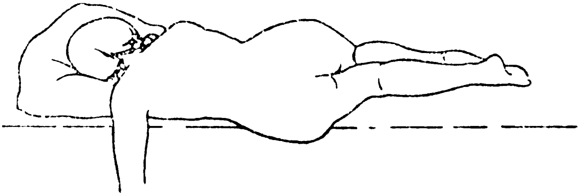


FIG. 252. The Sims position.

4. **The Genu-pectoral Knee-chest Position** (Fig. 253).—This position is used sometimes for the replacement of a retroposed uterus, and also for the examination by Kelly's cystoscope. The patient is directed to kneel upon the table near its edge, and with the thighs vertical, she rests her chest upon a small flat pillow on the table, her head lying just beyond so that the back slopes down evenly. She should be covered with a sheet which is looped up in the mid-line so that the two halves of its lower border fall together over the vulva. The legs and thighs must be warmly clad.

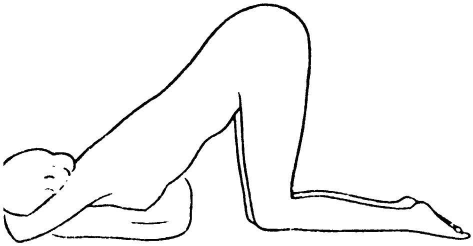


FIG. 253. The genu-pectoral position.

5. **The Upright Position** (Fig. 254).—This position is not often employed. It may be used to estimate the amount of prolapse of uterus or vagina suffered by the patient when walking about, or to test the efficiency of a pessary, or for examination of a hernia (p. 495). A sheet is fastened round the waist, the patient standing with one foot resting on the rung of a chair.

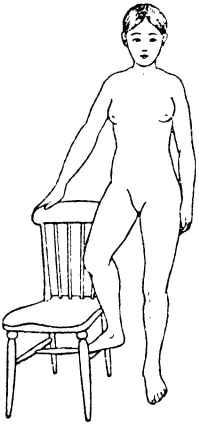


FIG. 254. The upright position.

6. **Lithotomy Position** (Fig. 201).—For this position the patient will usually be given an anaesthetic (for description see p. 446). When on the table, the patient should be covered with a small blanket, and a towel arranged over the vulva. When under the anaesthetic the nurse should tuck up the nightdress around the waist under the blanket, then fasten on the garters of the Clover's crutch below the knees (p. 454).

7. **Trendelenburg Position.**—A position commonly used in pelvic operations (for description see p. 455).

Methods of Examination.—*Abdominal examination.*—The abdomen is examined by inspection and palpation.

Vaginal examination.—The vagina is examined by inspection and manually.

Bi-manual examination is the palpation of the pelvic organs with two hands, one in the vagina or rectum and the other on the abdomen.

Rectal examination is used (1) to make a bi-manual pelvic examination in young girls or unmarried women when vaginal examination is undesirable; (2) to make out the relations of tumours in the pelvis and to locate the pedicles of ovarian tumours; (3) to examine the wall and contents of the rectum itself (Fig. 255).

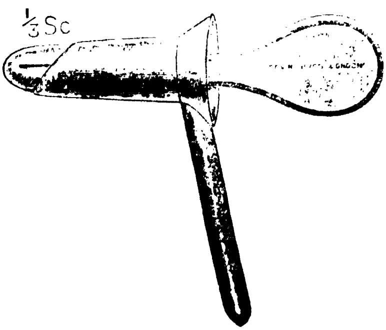


FIG. 255. Rectal speculum (proctoscope).

Recto-vaginal examination is useful to palpate swellings in the wall between the rectum and vagina. It is made with one finger in the vagina, and one finger in the rectum.

GYNAECOLOGICAL OPERATIONS

For gynaecological operations performed through the abdomen see p. 510.

Preparation of patient is that described on p. 499, in addition the following are necessary:

Purification.—Complete shaving (p. 438) of the vulva, except in some minor operations such as curetting, or dilating the cervix, when it may be sufficient to clip the hair short. A vaginal douche (p. 71) is given ½ hour before the operation, and the catheter may be ordered to be passed five minutes before the patient is taken to the operating-room, or the catheter may be passed and left in position, plugged with a spigot (for catheter see p. 66). In other cases the patient is directed to pass urine five minutes before being taken to the theatre and the vulva finally cleansed with an antiseptic lotion and a dressing applied. A clean T-bandage (p. 146) should be fastened round the patient's waist, the ends being rolled up and fastened with a safety-pin; the pin is removed when the patient is on the table, the ends being left rolled up. All these operations are performed with the patient in the lithotomy position (p. 454), the legs and thighs, therefore, require to be warmly clad.

Dressings required.—The usual ones (p. 40) and, in addition, tampons (p. 687), plugs, and strips of gauze in case they are needed. A second T-bandage must be provided in case the one on the patient becomes soiled.

After-treatment.—That described on p. 501 in addition to the following:

Position.—After operations in which drainage is required, or where there is any pelvic inflammation, the patients are nursed in the Fowler position (p. 26) as soon as they have recovered from the anaesthetic, in others they are kept flat with the knees flexed over a bolster (Fig. 6). After operations undertaken for the repair of torn tissue, such as perinaeorrhaphy, they are nursed flat with the knees over a bolster and tied together.

Diet.—Liquid diet is given until the bowels have acted, then fish, and later full diet.

After-dressing.—The outer dressing requires to be changed whenever the patient passes urine, the vaginal plugging or dressing is removed when ordered. The stitches are removed at varying times according to the nature of the operation and the wishes of the gynaecologist. Any time between the eighth and twenty-first day is common.

Aperient.—An aperient is commonly ordered on the second night after the operation, except in cases of repair of fistula, or perinaeorrhaphy (see plastic operations, p. 681).

Catheterization (p. 66) is ordered in some cases where it is essential to prevent the parts from getting wet; the nurse should inquire what the surgeon wishes as to this, and also as to whether vaginal douches (p. 71) are to be given, as they form an important part of the after-treatment in many cases. The length of time the patient is kept in bed is very variable: minor cases are kept in bed about ten days, others remain in bed until the wound has healed.

Operations on the Uterus.—Vaginal Hysterectomy is the removal of the uterus through the vagina. The after-treatment is mainly that given under abdominal hysterectomy (p. 510), with the exception of the dressing. The patient is placed in the recumbent position, with the knees tied together.

After-dressing.—The gauze packing is removed at the end of 36 hours, the lower part of the vagina may then be ordered to be swabbed every 4 hours, or douching may be prescribed. Catheterization is usual until after the forceps and the plugging have been removed. The patient is allowed up when the wound has firmly healed, usually about the seventeenth day.

Complications.—Sepsis, peritonitis (p. 512), haemorrhage (p. 563), injury to bladder or urethra.

Curettage of the Uterus.—Consists in scraping the lining of the uterus (endometrium). It is undertaken for dysmenorrhoea (p. 683), metrorrhagia (p. 687), endometritis (p. 683), menorrhagia (p. 687), and in some cases of retained placenta (see sapraemia, p. 711).

After-dressing.—The plugging is removed the following day. A vaginal douche is given twice daily subsequently. The patient is allowed up usually on the tenth day.

Fixation of the Uterus.—**Vaginal Fixation** is performed to correct displacement of the uterus, the object of the operation being to make a retroflexion into anteflexion (p. 684) by sewing the anterior surfaces of the uterine body to the peritoneum or to the cellular tissue in front of the cervix. Operations are also undertaken for the removal of cysts, fibroids, polypi, and various growths through the vagina. The treatment is that described on p. 679.

Operations on the Cervix.—**Emmet's Operation** is undertaken in cases of laceration of the cervix and consists in the removal of portions of the cervix.

Amputation of the Vaginal Portion of the cervix is also undertaken for inflammation, ulceration, or for hypertrophy.

Division of the Cervix may be performed for dysmenorrhoea (p. 683).

After-treatment.—The gauze drain—if there is one—is removed the following day.

An *aperient* is given on the second night. The patient is bathed with an antiseptic lotion as often as necessary, i.e. each time after micturition or after the bowels act. These patients are usually kept in bed for fourteen to sixteen days.

Stitches.—Usually removed on the twenty-first day if silkworm gut has been used.

Dilatation of the Cervix.—Dilating the cervix by the use of uterine dilators is performed for dysmenorrhoea, and preparatory to examination of the uterus. In obstetrical cases, the cervix is dilated by means of laminaria tents or bougies when it is necessary to induce labour.

Requisites for dilating the cervix with tents and bougies are: Laminaria, or sea tangle tents, or bougies; gauze, pledgets of sterilized absorbent wool, T-bandage. The plug is usually removed from 24 to 36 hours after insertion.

Plastic Operations.—Various plastic operations are undertaken for the repair of fistulae, the different kinds of fistulae being cervico-vesical (opening between the cervix and bladder); vesico-vaginal (between the bladder and vagina); urethro-vaginal (between the urethra and vagina); and recto-vaginal (between the rectum and vagina).

Colpocleisis is undertaken when all other means fail to close a vesico-vaginal fistula, the patient then menstruates into the bladder.

Colporrhaphy is a plastic operation for narrowing the vagina. Anterior or posterior colporrhaphy is spoken of according to whether the operation is performed on the anterior or posterior wall of the vagina. It is undertaken for the cure of prolapse of the uterus, and for the cure of cystocele (prolapse of the anterior wall of the vagina) and rectocele (prolapse of the posterior wall).

Perinaeorrhaphy is the operation for the repair of a ruptured perinaeum.

Colpo-perinaeorrhaphy consists in freeing the mucous membrane of the posterior wall of the vagina, and reconstructing the perinaeum.

After-treatment.—After operations on the perinaeum the patient's legs are tied together. The recumbent position is maintained, but the patient is allowed to turn with help.

Catheterization is commonly ordered for the three first days, but is not invariably the rule.

Diet.—Liquid or semi-solid diet is given until after the bowels have been opened, then increased to fish; later, full diet.

An *aperient* is usually ordered on the third night, but in some cases of repair of fistulae it may not be ordered until later. An olive-oil enema is given (p. 62) before the aperient acts in order to soften the motion and so prevent any undue stretching of the repaired parts. A simple enema (p. 62) may be ordered.

After-dressing.—The wound is re-dressed whenever it becomes soiled by any discharges, either urine, vaginal discharge, or faecal matter, and also after the passage of the catheter (p. 66). The wound is carefully swabbed, or gently irrigated with an antiseptic lotion such as perchloride of mercury (1–2000). Some surgeons order a vaginal douche in addition, the wound being carefully dried with wool on forceps subsequently. The success of these operations depends in a great measure on the nurse, as unless she keeps the wound clean and dry it will not heal by first intention (p. 517).

The *removal of stitches* is done by the surgeon at varying times, according to the nature of the operation, the kind of stitches used, and the condition of the wound. They are usually left in for twelve days or longer. After the stitches have been removed the patient is allowed to sit up in bed, and is usually allowed up within a day or two.

Operations on Bartholin's Glands.—Excision is performed in cases of cysts (p. 467) of these glands.

Abscess of the Gland is treated by incising and draining the gland. The *after-treatment* is that described on p. 679.

GYNAECOLOGICAL DISEASES

Cervical Erosion.—Abrasions of the cervix.

Treatment.—Rest in bed is usually prescribed, also gentle laxatives. Vaginal douches are ordered. Caustics and other drugs may be applied by the surgeon.

Dysmenorrhoea (p. 686).—*Treatment.*—Rest in bed during the first few days of the period. Fomentations (p. 90), electric thermal pad, or a rubber hot bottle may be applied to the abdomen. Hot drinks may do good. Drugs may be prescribed for the relief of pain, also hot sedative douches and enemata. As a preventative an efficient aperient should be taken immediately before the period is due.

Acute Endometritis.—Inflammation of the lining of the uterus.

Treatment.—Rest in bed in the Fowler position (p. 26) is necessary. Gentle laxatives or simple enemata (p. 62) may be ordered. Vaginal douches (p. 71) are commonly prescribed and may be either sedative, antiseptic, or astringent. A light nourishing diet is required. Sleep is important and if not obtained the nurse must report to the physician.

Chronic Metritis.—Chronic inflammation of the uterus. The patient is not confined to bed as a rule. Counter-irritation by means of glycerine pessaries (p. 764) or leeches (p. 103) may be prescribed.

Parametritis.—Inflammation of the cellular tissue of the pelvis.

Treatment.—Rest in bed in the Fowler (p. 26) position until all swelling has disappeared is essential. Vaginal douches (p. 71), gentle laxatives, or simple enemata (p. 62) may be ordered. Light diet is given until the temperature is normal.

Perimetritis.—Pelvic peritonitis.

Treatment.—Rest in bed in the Fowler position (p. 26) is necessary. Hot antiseptic douches and gentle laxatives may be ordered. A sedative such as opium may be prescribed if necessary for a day or two. Counter-irritation, either glycerine pessaries (p. 764) or leeches (p. 103), may also be ordered. Liquid diet is given until the temperature is normal. (For general nursing see p. 212.)

Salpingo-Oöphoritis.—Inflammation of the tubes and ovaries.

Treatment.—Rest in bed in the Fowler position is essential. Fomentations may be ordered for the relief of pain, also hot vaginal douching (p. 71), gentle laxatives, and counter-irritation. Bromide may be prescribed for sleeplessness, and tonics are commonly ordered.

Pelvic Haematocele.—A tumour formed by extravasation of blood into the peritoneal pouch situated between the uterus and the rectum, or into the sub-peritoneal tissue situated behind and around the uterus.

Treatment.—Absolute rest in bed until the blood has been absorbed is imperative. Gentle laxatives or enemata are ordered. Morphia may be prescribed if there is much pain. The nurse must watch carefully for signs of further haemorrhage (see internal haemorrhage, p. 511), and report at once to the doctor should they occur. The patient is not allowed to move about in bed or help herself in any way until the doctor gives permission. (For general nursing see p. 212.)

Menorrhagia (p. 687).—*Treatment.*—Rest in bed in the recumbent position is ordered, the foot of the bed may be raised on blocks. The following drugs may be prescribed: Ergot, digitalis, calcium lactate, also very hot douches (p. 71). Dilatation of the cervix (p. 681) may be performed for examination. The patient is kept absolutely at rest until the doctor gives permission for her to sit up or move about in bed. Careful record is kept of the number of pads used in the 24 hours, and it may be necessary to keep them for inspection by the doctor. Observation must also be made as to the amount of blood passed with the urine, a specimen being kept for inspection if necessary. (For general nursing see p. 212.)

Leucorrhoea.—A whitish discharge from the vagina.

Treatment.—Douches are commonly prescribed, and in severe cases rest in bed may be ordered. Gentle laxatives are necessary. A liberal, nourishing diet is given with extra milk.

Vaginitis.—Inflammation of the vagina.

Treatment.—Vaginal douches (p. 71) are commonly prescribed and are administered frequently. Drugs may also be applied to the vagina. Tampons (p. 687) soaked in glycerine or other drugs may be introduced. The patient is kept in bed for rest, and suitable food and tonics are ordered.

Displacements.—Displacement is the term applied to any position in which the uterus may be apart from the normal. Displacements commonly met with are:

1. *Retroversion,* in which the uterus as a whole is turned towards the back.
2. *Anteversion,* in which the uterus as a whole is turned towards the front.
3. *Retroflexion,* in which only the fundus of the uterus is bent backwards.
4. *Anteflexion,* in which the fundus of the uterus is bent forwards.
5. *Prolapse of the uterus* means that it has fallen so as to become visible in the vaginal orifice.

6. *Procidentia* is a prolapse of uterus in which it comes down outside the vulva.

Treatment.—Uterine displacements are usually replaced by the gynaecologist, a pessary being inserted subsequently to maintain the uterus in position. Vaginal douches are commonly ordered once a day for cleansing purposes. The patient may or may not be kept in bed, according to orders. Severe conditions may be treated by operation, for which see p. 680.

Pessaries.—Pessaries are instruments which are introduced into the vagina to retain or support the uterus or vagina in proper position, and so correct displacement. They may be made of vulcanite, metal, or rubber, and are of many different shapes and sizes. Two commonly used are Hodge's pessary (Fig. 256), and the watch-spring ring pessary (Fig. 257).

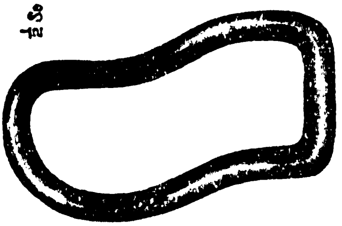


FIG. 256. Hodge's pessary.

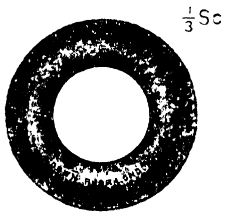


FIG. 257. Watch-spring ring pessary.

New Growths of the Uterus.—Uterine neoplasms may be classified thus: *Simple*, fibroids, adenomyoma; *Malignant*, sarcoma and carcinoma either of the body or cervix of the uterus.

Fibroids.—The etiology of these tumours is not known. They occur most commonly between the ages of twenty-five and forty-five.

Symptoms.—The symptoms vary according to the position, size and type of the fibroid. Any of the following may be complained of: indigestion, constipation, frequency of micturition, menorrhagia, dysmenorrhoea. On the other hand, no symptoms may be noticed until acute abdominal symptoms (p. 505) are present, which may result from torsion of the pedicle, degeneration, haemorrhage from the surface of the tumour or suppuration.

Treatment.—The usual treatment is the removal of the fibroid either by myomectomy or hysterectomy (p. 681). In inoperable cases X-ray treatment is advised (p. 726).

Malignant Growths.—Sarcoma of the uterus commonly occurs between the ages of forty and sixty or before puberty; carcinoma, between fifty and sixty years.

Symptoms.—The symptoms are usually typical and come on at, or several years after, the menopause (see climacteric). A patient who has had no periods for a few years complains that she had a slight show for a few days, then no bleeding for a time, then a flooding. All may subside for a time, then another flooding occurs. The loss in the interval between the floodings nearly always becomes offensive and may contain shreds of broken-down tissue.

It must be insisted that flooding, intermittent haemorrhage, and sanious or 'foul' discharge are not symptoms of the normal 'change.' All excessive haemorrhage at or about this time should be looked upon with grave suspicion, the patient must be advised to consult a gynaecologist without delay in order that a thorough examination may be made.

Treatment.—If cancer is present, total hysterectomy with wide removal of the ovario-pelvic ligaments, or Wertheim's operation (p. 510), is the only treatment. In inoperable cases treatment by X-ray or radium is advocated (p. 726).

TERMS USED IN CONNECTION WITH MENSTRUATION

Menstruation.—The periodical discharge from the female generative organs of a fluid containing blood, secreted by the inner surface of the uterus. The menstrual periods occur usually at intervals of a month, their duration being from three to six days. (See also p. 187.)

Amenorrhoea, absence, or cessation for a time of the menstrual flow.

Dysmenorrhoea, painful or difficult menstruation.—The principal types are: ***congestive***, due to an intense congestion of the pelvic viscera; ***inflammatory***, due to inflammation; ***membranous***, a very painful form, characterized by the discharge of shreds of menstrual decidua; ***obstructive***, due to mechanical obstruction to the free escape of the menstrual fluid; ***ovarian***, due to disease of the ovaries; ***spasmodic***, due to spasmodic uterine contraction; ***vascular***, pain, congestive symptoms in the genital apparatus and tenesmus of the bladder and anus some days before menstruation.

Spasmodic dysmenorrhoea occurs in young girls one to three years after the commencement; the pain begins with the onset of menstruation in the lower part of the abdomen in the middle line, and lasts from 2 to 24 hours, and may quite incapacitate. It usually lessens with age, but may need surgical treatment. It is commonly cured by pregnancy.

Congestive dysmenorrhoea occurs in older women who have had children. The pain precedes menstruation by a day or two and is relieved when the flow commences.

Obstructive dysmenorrhoea is characterized by pains due to contractions of the uterus in an attempt to remove a clot.

Menorrhagia, also termed 'flooding,' menstruation occurring at too short intervals accompanied with excessive discharge.

Metrorrhagia, haemorrhage not limited to the time of menstruation.

Climacteric Menopause (change of life), the period of life at which menstruation ceases, commonly between forty-five and fifty years of age.

Preparation of special dressings and appliances.—For preparation and sterilization of instruments, swabs, dressings, bowls, towels, etc., see sterilization, p. 40.

Vaginal swabs.—Swabs for vaginal operations are made of absorbent wool enclosed in small pieces of gauze; they should be about 4 inches square (for sterilization, see p. 40).

Bougies.—To prepare bougies for the induction of labour, wash them carefully, and plunge them into boiling water for 10 minutes, but do not boil them. Place in perchloride of mercury (1–500) for 30 minutes. Put into Lysol (1 per cent solution) before use to remove any roughness. Another way is to sterilize them in dry formalin (see gum elastic catheters, p. 43).

Laminaria tents.—Wash with ether, then keep in solution of perchloride of mercury (1–500) and absolute alcohol (1–100). They must not be placed in water, as they swell and become useless.

Tampons are much less used than formerly.

To make.—Cut strips of absorbent wool 3 inches wide, roll tightly into little bolsters, and tie around the centre with securely knotted, and strong, silk or string, the ends of which are sufficiently long to come beyond the orifice of the vagina when the tampon is in position. Kite-tail tampon: tie two or three tampons a few inches apart on one string. The tampon is sterilized (p. 40) and may be saturated with sterilized glycerine and water (1–2) (glycerine pessary), or it may be soaked in any solution ordered.

To introduce a tampon.—Have the patient on her back with the knees separated and flexed. Having taken the usual antiseptic precautions (p. 431), introduce the speculum and keep in position with the left hand. Take the tampon in long uterine dressing-forceps with the right hand and pass it into the pouch-like cavity between the cervix and the posterior vaginal wall. Withdraw the speculum, and leave the ends of the tampon just within the vagina so that they do not become soiled with urine. If more than one tampon is required a kite-tail tampon is used. To withdraw, gently pull the string. A record must be kept of all tampons inserted and withdrawn.

To pack the vagina.—This duty is not as a rule entrusted to the nurse, but it is one she should know how to perform in case of emergency. Long strips of gauze are used for packing. In an emergency, strips of linen, calico, etc., may be used after boiling. Have the patient in the dorsal position (Fig. 250) with the knees flexed and separated. Having taken the usual antiseptic precautions as to hands, etc. (p. 431), and bathed and cleansed the external genitals (p. 679), pass the speculum (p. 674). Take the sterile strip of gauze on the end of long uterine forceps and pass it up to the cervix and pack it into the space between the cervix and the vaginal walls. The rest of the cavity is packed, withdrawing the speculum gradually. If more than one strip is needed it must be tied to the end of the preceding strip. If, on removal, any odour is noticed it should be reported. The number of strips inserted and withdrawn are noted. In an emergency, if no forceps or speculum is at hand, insert the packing with the finger of the right hand.

Ligatures for tying the cord in a newborn infant should be sterilized by boiling for one hour, and immersed in carbolic (1–20) until required for use.

CHAPTER XXIII

OBSTETRICAL NURSING

A Midwife is a women trained to attend confinements, and fulfil all duties, without the attendance of a medical man, provided the labour is a natural one. It is her duty to send for the physician in all abnormal cases.

A **Monthly Nurse**, or maternity nurse, is one who has been trained in the performance of all nursing duties connected with a confinement. She must in all cases send for the physician when labour starts, as she is not qualified to deliver the patient.

The following Rules should be observed by those attending a Lying-in Woman:

1. To be scrupulously clean in person and apparel (p. 3).

2. To keep the hands free from cracks or cuts, and the nails short (see care of the hands, p. 46).

3. Before cleansing the vulva (p. 12), douching (p. 71), passing a catheter (p. 66), or otherwise touching the genitals, to turn up the sleeves above the elbows, and scrub the arms and hands, particular care being directed to the nails, with a clean nail brush and hot water and soap; rinse off the soap, and scrub again (with a second nail brush) for a minute or two in perchloride of mercury lotion (1–1000), and proceed to attend the patient without drying the hands, not having touched anything unsterilized between disinfecting the hands and attending the patient.

4. To keep the patient and everything that will come in contact with her perfectly clean.

5. To boil after use, vaginal tubes—which should always be of glass—and catheters, and keep them in perchloride of mercury (1–1000) or carbolic lotion (1–20) (see sterilization, p. 44).

6. To boil all metal and glass instruments before use, and put them in carbolic lotion (1–20) unless otherwise ordered.

7. To cleanse, scald, and thoroughly disinfect bedpans, bedbaths each time after use (p. 10).

8. To place in a basin, pail, or some easily washed receptacle, all soiled linen, and remove it as soon as possible. The after-birth (placenta) should be placed in a basin and removed from the room as soon as possible; it must be got rid of by burning as soon as it has been inspected by the physician.

9. To keep the room well ventilated (p. 5).
10. To remember never to expose the patient more than necessary.
11. To consider the feelings of the patient, and treat her in all respects as one would wish to be treated oneself.
12. When engaged in private nursing, should time permit, a warm bath should be taken and clean clothes put on before going to a new case.

In hospitals, labour is conducted like a surgical operation, the labour room is prepared as an operating theatre. The doctors and nurses prepare themselves as for a major operation (p. 429). The patient's vulva and skin around the perinaeum is shaved, the buttocks and thighs cleansed (see purification, p. 437).

THE MOTHER

Signs and Symptoms of Pregnancy:

1. Cessation of menses.
2. Morning sickness, occurring at the end of the first month (p. 184).
3. Enlargement of abdomen. Striae on abdomen.
4. Enlargement of breasts and veins, pigmentation of the areolae, colostrum in breasts (p. 692).
5. Possibly pigmentation of the face and abdomen (p. 188).
6. Purple discoloration of vagina.
7. Frequent micturition.
8. Movements of foetus.
9. Ballottement.
10. Foetal heart sounds, discernible at the fifth month, the beats being generally twice as rapid as the mother's pulse, and so distinguishable from the uterine souffle.
11. Foetal parts felt.
12. Flattening of the umbilicus.

Management.—During pregnancy the patient should have plenty of fresh air and exercise, short of inducing fatigue. A warm bath may be taken daily. The bowels should be carefully regulated, only mild aperients must be taken, and those only if necessary. If morning sickness (p. 184) occurs, a light meal should be taken in bed before rising; should the sickness be persistent, further advice should be sought.

The corsets should be removed during the latter months and no tight clothing should be worn. During the last month of pregnancy it is advisable to wash the nipples with soap and water so as to remove any hard crusts that may have formed, then apply spirit, either methylated spirit or eau de Cologne; this treatment will probably prevent the patient suffering from cracked or tender nipples when subsequently nursing the baby. The probable date of confinement may be ascertained by adding a week to the last day of the last menstrual period, then counting back three months. Another way is to count from quickening (the time the mother is first aware of the movement of the foetus), add twenty-two weeks and the probable date of confinement will be found (see also obstetrical table, p. 857).

On external examination of the abdomen by palpation, the following conditions may be ascertained:

1. Whether the patient is pregnant, stage of pregnancy, and whether single or multiple.
2. The position and size of the foetus.
3. Whether hydramnios (p. 692), or Bandl's ring (p. 692) is present.
4. If the patient be in labour.
5. Condition of the uterus, whether it is in tonic contraction, or painful to the touch.
6. Full bladder.

The height of the fundus during each month of pregnancy is as follows:

2nd month. The uterus is a little larger than a cricket ball.

3rd month. About the size of a coconut.

4th month. It rises to the level of the symphysis.

5th month. The fundus is half way between the symphysis and umbilicus.

6th month. The fundus is level with the umbilicus.

7th month. Fundus about nine inches above the symphysis.

8th month. Fundus is midway between the umbilicus and the ensiform cartilage.

9th month. The fundus reaches the ensiform cartilage, and towards the end of this month falls again to position of eighth month.

Signs of Approaching Labour:

1. Sinking of the fundus, breathing becoming easier.
2. Irritation of bladder and rectum.
3. Fixing of presenting part.

The Signs and Symptoms of Labour are:

1. 'True pains.'
2. 'Show.'
3. In multiparae the presenting part becomes fixed.
4. Dilatation of the os.
5. Frequent desire to micturate.

'**True Pains.**'—Are regular in character, become stronger and more frequent as labour proceeds, and continue until labour is ended. The uterus becomes harder with each pain, and soft again as the pain dies away.

'**False Pains**' are most often due to some disorder of the intestine, or over-exertion, and can be relieved. They occur usually in the abdomen and are irregular in character, and no progress is made with labour.

The '**Show**' is a discharge of mucus streaked with blood.

Hydramnios.—The term applied to an abnormal accumulation of liquor amnii.

Bandl's Ring is marked by thinning of the lower uterine segment, and a ridge which may be felt about two inches above the symphysis. Although present in normal cases it is not felt unless labour be prolonged, when it is continually rising higher. To distinguish between it and a distended bladder, pass a catheter.

Colostrum is the secretion first produced in the mother's breasts and acts as a purgative to the infant.

The 'Lying-in' Room.—The 'lying-in' room should be well ventilated and all unnecessary furniture removed (see preparation of the sick-room, p. 4). The bed should be placed in a good light, and in such a position that it can be got at from all sides; it must be placed as much as possible out of draughts.

A square of linoleum or oil-cloth, or failing one of these, a sheet of strong, new, brown paper should be placed over the carpet at the right-hand side of the bed.

The bed should be made in the following manner:

Procure a narrow bedstead if possible, and if a wire mattress is used which is very springy, suitable boards should be placed under the hair mattress and removed as soon as labour is over. Two mackintoshes are necessary, each 1 yard wide by 1½ long. The bed is made in the usual way as far as the mackintosh and drawsheet (p. 20). The second mackintosh should be placed on the right-hand side of the bed, so that it reaches almost to the bottom, thus preventing the mattress from becoming soiled; over this a sanitary sheet should be placed which can be burned after use, but if this is not procurable, a clean sheet or quilt folded in four may be used. The top sheet may be folded over the blankets on the right side and pinned so that they may be kept clean and tidy, and lifted together.

Requisites.—Two foot-baths, one in case a douche is required (p. 71), the second for the baby's bath, slop-pail or basin for soiled linen. Four basins for the following purposes: (1) For the doctor to wash his hands; (2) for the doctor to rinse his hands; (3) containing perchloride of mercury lotion (1–1000) with sterilized nail brush; (4) for the nurse's hands. Three nail brushes—penny ones will do as long as they are new and have been boiled; one should be placed in the antiseptic lotion for the hands, the others to be used with soap and water. One or two empty basins or dishes for instruments if required. Carbolic or other antiseptic soap. Three jugs, one to be used as a douche can if this is not available. Perchloride of mercury soloids, Lysol (2 per cent) or other antiseptic lotion. Flask of sterilized saline solution (concentrated, see p. 46). Plenty of hot and cold sterilized water. Kettle of boiling water; antiseptic gauze and wool. Sanitary pads. Receiver for placenta. Soap-dish bottom containing absorbent wool swabs and warm boracic lotion for baby's eyes. Small blanket to wrap the baby in; scales for weighing the infant; strong white linen thread for ligatures. Needle and cotton, thimble; strong safety-pins. Binders, for mother and child. Six clean soft towels; new ones should not be provided; two tumblers, feeding-cup, teaspoon. Graduated medicine glass, minim measure, brandy. Hypodermic syringe (p. 84). Ergot, ergotine. Hot-water bottles and covers. Bed-pan (p. 20). Clinical thermometer, bath thermometer. Charts. Pair of blunt-pointed scissors. Rubber (No. 8) catheter, glass catheter (p. 66, Fig. 24), glass douche nozzle, douche-can (Fig. 28), Higginson syringe, rectal infusion apparatus (p. 58). Infant's garments, washing flannels, etc. (p. 698). If the weather is cold, a fire should be kept burning in the room, as the temperature should be about 60° F. (p. 7).

Normal Labour.—When the child presents by its vertex, labour pains begin, and the child is born within 24 hours, apart from complications, with safety to mother and child, the labour is termed normal or natural.

Stages of Labour.—There are three stages of labour, viz.:

First stage.—From the time the true labour pains begin until the os is fully dilated. Usual time in a primipara, 12–14 hours, in a multipara, 6–8 hours.

Second stage.—From the full dilatation of the os to the birth of the child. Duration in a primipara usually 2–4 hours, in a multipara, 1–2 hours.

Third stage.—From the birth of the child to the expulsion of the placenta and membranes. Duration variable.

Management of Natural Labour.—*First stage.*—At the onset of labour an aperient should be given, one ounce of castor oil is the most effectual and the safest. The vulva is cleansed and shaved. The patient is instructed to pass urine frequently; she should not be allowed to 'bear down' at this stage, as it will be useless and will waste energy which will be required later. One vaginal examination should be made, but only by the qualified midwife. Frequent examinations at this stage are to be avoided. The patient is clothed in a clean nightdress, stockings, slippers, and dressing-gown; her hair being plaited in two plaits. She may be allowed to walk about as much as she desires at this stage. Her food should be light but nourishing, egg-flip, beef tea, gruel, etc.; nothing solid is given, as it is liable to cause sickness, and an anaesthetic may be required later. During this time the room and the baby's clothes should be prepared so that everything is in readiness for the second stage.

Second stage.—The onset of this stage will be recognized by the change in the character of the pains, frequent desire to go to stool, rupture of the membranes, and possibly sickness. The doctor should now be sent for if he has not arrived.

The patient should have the dressing-gown and slippers removed, and a clean warm flannel petticoat, opened down the back, should be slipped on under her nightdress, the latter being rolled up to the waist, or pinned over the shoulders to prevent it becoming soiled; a bed jacket should also be worn. The patient is then put to bed, but not compelled to lie in one position.

A simple enema (p. 62) is given, and if the patient is unable to pass urine, a soft catheter should be passed (p. 66) so as to remove all possible delay from the head descending. A douche of warm perchloride of mercury (1–5000) is next given, after which the vulva, labia, and buttocks are carefully washed with carbolic soap and warm water, and when the soap has been thoroughly rinsed off, the parts should be well washed with warm perchloride of mercury (1–1000) which must not be dried off. The patient is instructed to 'bear down' during the pains and rest in the intervals. Her back may be supported, and a round towel fastened to the bottom of the bed may be given to her to pull on during the pains. Towards the end of this stage, the anus will become distended and the perinaeum stretched. When this occurs, remove the towel and tell the patient to pant instead of 'bearing down' during the pains. The patient should now be lying on her left side with her hips well over the edge of the bed, the knees drawn up with a pillow placed between them to keep them apart.

If the doctor arrives before the child is born, the nurse will simply act under his directions; if not, she should proceed as follows. In order to prevent the perinaeum from becoming lacerated, after having purified the hands (see p. 689), place the left arm between the buttocks and as the head descends keep the fingers pressing on it during a pain in order to keep the head flexed and to give the perinaeum time to stretch. Maintain this flexing of the head until the occiput is born, then push the head forward as the pain is passing off. As soon as the head is born, feel if the cord is round the child's neck, and if so, pull down a loop and slip it over the head. Should more than one loop be twisted round, do likewise, or pull down enough to prevent any pressure on the throat. If the cord is too tightly twisted for this, and if time permits, ligature it in two places and divide it between. When this has to be done the child should be delivered as quickly as possible. Before the child has had time to open its eyes they should be well washed with warm boracic lotion (p. 699), the mucus from the mouth and throat must also be removed, then support the head until the next pain comes, which will cause one or other shoulder to be born, after which the rest of the body will appear rapidly. Place the child on its side on a small warm blanket whilst waiting for the cord to cease pulsating.

Third stage.—As soon as the child is born turn the patient on to her back, this closes the vagina and so prevents air gaining entrance to the uterus which might cause sapraemia (p. 711); it is also a better position for controlling the uterus and more restful to the patient. Keep one hand on the fundus and notice if it is well contracted; if it is relaxed, knead it gently, but not otherwise. When the cord has ceased pulsating ligature it in two places, one ligature 1½ inches from the child's umbilicus, the second close to the mother's vulva. The reasons for the second ligature are: to be able to judge when the cord has lengthened; and because in the case of a twin pregnancy (as both children may be supplied from the same placenta) the second child might bleed to death before it was born if the cord of the first had not been tied. After ligaturing the cord divide it about one inch from the ligature nearest the child, examine the stump to see if there is any oozing; should this be the case tie on another ligature. The child is then wrapped in its blanket and put in a safe place whilst the mother is attended to. Note the patient's aspect and pulse (p. 200) frequently during this stage of labour. The placenta is not expressed until it has left the uterus and is in the vagina; this usually happens about the third and fourth contraction, but may be later.

Signs of the Placenta having left the Uterus.—As soon as the uterus becomes harder and smaller, and when more of the cord slips into the vagina, it may be assumed that the placenta has left the uterus. To express the placenta: Rub the fundus gently until it is quite hard, then, grasping it in the left hand, press in a downward and backward direction and instruct the patient to 'bear down.' The placenta should be received in the right hand, the left hand still grasping the uterus; hold the placenta close to the vulva, then turn it round and round gently so as to twist the membranes into a kind of rope. The uterus, which should now be empty, must be kept under control by the hand on the fundus for at least half an hour. Remove the soiled petticoat, top mackintosh, and sanitary sheet, wash the vulva with warm perchloride of mercury (1–2000) and apply the pad and diaper. The pad should consist of absorbent wool enclosed in gauze, or gamgee tissue, and should be long enough to reach from the sacrum to the symphysis; if it has not been sterilized, it should be rendered sterile by scorching. The *binder* (p. 706) is then applied and the patient made comfortable. She may now be given a warm drink, see that her feet are warm, take the temperature and pulse, examine again to see that the uterus is still well contracted and that there is no excessive loss of blood.

Management during 'Lying-in' Period.—When the labour is over, and the patient has been rendered comfortable, encourage rest, perfect quietness, and sleep. Have the room lit enough to observe the patient's appearance, and be on the watch for haemorrhage; this may be done without constantly disturbing her to feel if the uterus is well contracted. Watch most carefully her breathing, pulse, appearance (see symptoms, p. 209) and note whether she complains of the binder getting tight, and of feeling thirsty. If the pulse is below 100, there is no cause for fear. Restlessness is a bad sign. A large quantity of blood may be contained in a relaxed uterus without any blood on the pad, therefore the usual signs of internal haemorrhage must be the guide (see p. 511). The patient must not be allowed to sit up in bed, as haemorrhage may result. If possible, get her to pass urine two or three hours after delivery; if she cannot pass urine at the end of 8 hours, try her on her knees and elbows (Fig. 258); if this fails, pass the catheter (p. 66), as she should not be allowed to go longer. Should the patient be in pain, and the uterus not contracting properly, the catheter is passed at once. In cases where the perinaeum has been ruptured, or when the patient is much exhausted, she is not allowed to turn on her elbows and knees. After the third day if she is progressing favourably, she may be propped up in bed to pass urine, this also helps to bring away any clots that may have lodged in the vagina. The temperature and pulse should be taken and charted three times a day for the first four days, then night and morning. The temperature usually rises a little during the first 12 hours, the pulse remaining about normal. If the pulse remains at 100 or more, it generally denotes exhaustion, and haemorrhage is more likely to occur.

The diet should be chiefly liquid or semi-solid, with the addition of toast and biscuits, until the bowels have acted; it is then gradually increased until the patient is taking full diet. Stimulants are not given unless ordered by the doctor. An aperient is given about 48 hours after delivery, castor oil, liquorice powder, or any aperient the patient is in the habit of taking; this should be followed by a simple enema (p. 62) if necessary.

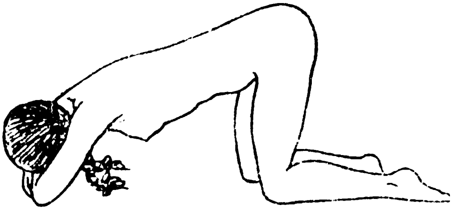


FIG. 258. The knee-elbow position.

The Lochia.—The term is applied to the discharge from the uterus and generally continues for ten or twelve days after delivery, sometimes longer. During the first three days it is bright red, and is called lochia *rubra*; from the third to the seventh day it is of a light-red colour, gradually becoming pink, and less in quantity, and is called lochia *serosa*; after the seventh day it becomes a pale yellowish-green colour, then almost colourless, and much less in quantity, and is called lochia *alba*. Healthy lochia leaves a stain on the sheet that is red in the centre, pale at the edge; the contrary is the case if the lochia is unhealthy, the centre of the stain being pale and the edge red or brown. Observation should be made as to the colour, quantity, and odour; also if clots or pieces of membrane are passed; any deviation from the normal being reported to the doctor. Observation must be made on the size of the uterus; it should involute, or shrink, about ¾ inch daily.

The condition of the breasts should be noted (see lactation, p. 713), and the milk not allowed to accumulate in them. The breasts and nipples are washed with soap and water every night and morning, and after carefully drying them a little spirit and water should be applied; the nipples should be bathed with boracic before and after putting the child to the breast.

When washing (p. 11) or otherwise attending to the patient, care must be taken to uncover her as little as possible; a lying-in woman's skin is usually active, particularly during the first week, and she is therefore susceptible to chills. Whilst the bed is being made she should be covered with a blanket, when changing the under-sheets she should be rolled from side to side (p. 21). Windows and doors should be closed before washing or in any way uncovering the patient, but the window must be reopened at once. The vulva is bathed with an antiseptic lotion at least three times a day, oftener if necessary, Lysol (1 per cent) is satisfactory for this purpose. The nurse should be as economical as possible with the patient's bed and body linen, at the same time any article that becomes soiled should be changed at once. Soiling of linen can be prevented by the careful application of pads and diapers; these should be changed frequently and not allowed to become soaked. After the third day the patient is gradually raised in bed by putting extra pillows under the shoulders, by the end of a week she may be propped up in a sitting posture. She may be allowed out of bed when the uterus has become a pelvic organ, when bright-red lochia ceases, and when the pulse and temperature have remained normal for 48 hours; this is usually about the end of ten days. She may be allowed out, if the weather is suitable and her condition satisfactory, a week after she has been up and about.

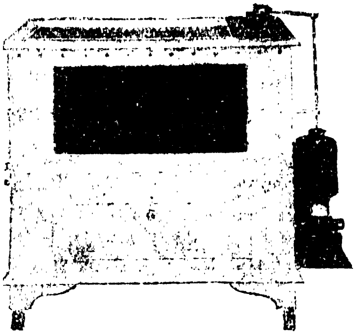
Management of the Newborn Infant

As soon as the cord has been tied the baby is warmly wrapped up and put in a safe place till the mother has been attended to. If the nurse is alone the baby should be kept on the bed, or somewhere near, so that the cord may be looked at now and again to see that there is no bleeding. Having settled the mother comfortably and tidied the room, the nurse should attend to the baby.

Baby's Bath.—The following things should be ready before taking the baby. Small bath with hot and cold water, bath thermometer, threaded needle, cotton, thimble, scissors, safety-pins, ligature for retying the cord, small square of boracic lint, or pad of absorbent wool covered with gauze for dressing the cord, boracic powder, dusting powder, sponge, wash flannel, soap (preferably 'baby's soap'), warm boracic lotion for eyes and mouth, warm oil or vaseline, sponge, two soft towels, baby's clothes, which should be hung near the fire to warm. The temperature of the water should not be below 100° F. for the first bath, afterwards it should be between 98° F. and 100° F. Never trust to the hand for testing the water, a bath thermometer should always be used; but, if for any reason it is not obtainable, use the elbow as a guide. When bathing the baby the nurse should wear a flannel apron, and a soft towel fastened at waist; the towel is slipped away as soon as the baby is dry. The bath is prepared in front of the fire, all windows and doors should be shut, and a screen or some improvised shield arranged round the chair to prevent draughts at the back. During the washing the nurse must observe whether there is any abnormality present, such as hare-lip, cleft palate, club-foot, webbed fingers or toes, phimosis, hernia, imperforate anus, or spina bifida (see Chapter XVIII, p. 608). Any deformity is to be reported to the doctor, and not mentioned to the mother without the doctor's permission. The infant is bathed once a day until the cord falls off, and sponged in the evening; a bath may then be given twice a day.

To wash the Infant.—*Method.*—Before uncovering the child its mouth and eyes are washed with warm water or boracic lotion. If there is much vernix caseosa (an oily secretion) on the skin, rub a little oil or vaseline all over and wipe off gently with a soft cloth. First wash the head and face and dry carefully; having well soaped the washing flannel, wash the entire body under cover of the apron. Do not lift the child, but roll over carefully when necessary. Next place the left hand and arm under the baby's head and neck, and the right hand under the buttocks and lift it into the bath, keeping the left hand in position all the time; sponge well all over as quickly as possible, then take the baby out and wrap in the towel and apron and gently pat it all over; unwrap it and press the towel in all the folds and creases of the body, then apply powder. The cord is carefully dried, powdered with boracic powder and retied, after which wrap it in the lint or pad prepared and apply the binder. The vest and napkin are then put on and the baby dressed. Whenever a garment such as binder, barrow, etc., can be stitched, do so instead of using pins. When putting on the gown or petticoat draw up over the feet instead of the head as this disturbs the child much less. When the child is dressed, attend again to the eyes, nose, and mouth. With a small piece of soft linen or absorbent wool wash the eyes with warm boracic lotion, using a clean swab for each eye. Then place a piece of linen around the little finger, dip it in the water or lotion and swab out the mouth, going carefully all round the roof and gums; next clean the nose, and be sure it is thoroughly clean, as obstruction greatly interferes with suckling and breathing. The infant is then placed in its cot lying on its side and warmly but lightly covered over.

The pattern of the baby-clothes does not matter, provided the under ones are made of wool with high neck and long sleeves and do not all open in front. Socks should be worn, also a head-flannel made of some light material. Diapers must be changed directly they are soiled or wet; sponge, dry, and powder the buttocks before applying the clean diaper. Napkins must never be reapplied without washing and airing; they should not be washed in water containing soda. Premature or weakly babies are not washed, but rubbed over with warm oil, wiped with a soft cloth, and wrapped in cotton wool over which a flannel gown should be worn. An incubator (Fig. 259) may be necessary for these infants, or an electric thermal pad or blanket may suffice.



Charles Hearson & Co.

FIG. 259. 'Thermostatic Nurse' (Baby Incubator) for premature or weakly infants. It is heated by electricity, gas, or oil. It is also supplied on loan for private practice if desired.

Sleep.—A healthy child sleeps most of its time during the first month, only waking to be attended to or fed. The infant should sleep in a separate bed from its mother, as there is danger of it being overlaid. It should be placed in its cot awake, and taught from the first to go to sleep without rocking; it is placed on its side in the cot, never on its back, as should it vomit, some of the vomited matter might enter its trachea and so cause suffocation.

Urine is usually passed once in the first 24 hours after birth (if not, the doctor should be informed, especially in girls), and after that 8–10 times in the 24 hours (see p. 715).

The **Bowels** act from 2–4 times in the 24 hours. The evacuations, for the first two or three days, consist of *meconium*, and are dark greenish-brown in colour; after the meconium has cleared away, the motions should be of a bright-yellow or orange colour, and should not contain any curds. The cord usually separates about the fifth day, but may not do so for a few days later; it must be kept perfectly clean, dried well after each bath and re-dressed.

Feeding.—The best food for the infant is the mother's milk, but if from various causes the mother is unable to supply it, artificial feeding is resorted to (see infant feeding, p. 591). The child should be put to the breast as soon after confinement as the mother is rested, as this causes the uterus to contract, helps to draw out the nipple, and teaches the baby to suck. The infant is to be fed with absolute regularity, and should be wakened if asleep; the child will soon get into regular habits, and wake itself with surprising regularity when meal time comes.

If the mother has no milk for the first two days, it is not necessary to feed the infant for this length of time, but a tablespoonful of slightly sweetened and warmed water will do the child no harm if it is thirsty, and this will satisfy the mother. Breast-fed babies should be fed every 6 hours during the first 24 hours, every 4 hours during the second day, and from the third day every 3 hours during the day and miss one feed during the night. When suckling the infant, the mother is instructed to nurse from each breast alternately.

Weight.—The baby should be weighed at birth, then once a week. A healthy child loses weight for the first few days after birth, then makes up what it has lost, sometimes more, by the end of the first week; afterwards it gains from one to two ounces a day (see weight, p. 855). A child that is not thriving loses weight, the flesh becomes flabby, the skin wrinkled and shrivelled, and the child is fretful; although some infants in this condition sleep constantly and are never heard to cry, these cases are generally those of weakly or premature babies who drop off to sleep before they have taken enough nourishment.

A depressed fontanelle, widely separated sutures, and cold extremities indicate a state of lowered vitality; any child in this condition requires very special care from the nurse as to its supply of food and warmth.

Crying.—A certain amount of crying is indispensable to a healthy infant, not a fretful worrying whine, but a good hearty cry. A baby who has not a strong cry is in a serious condition, and it should be made to cry occasionally in order to exercise its lungs. Medical advice should be sought for children in this condition. When a healthy infant cries it is for one of the following reasons: it is either hungry, uncomfortable, thirsty, or in pain. The cause should be found and remedied. (For typical cries of infants see p. 587.)

COMPLICATIONS

The doctor in charge of the case should be sent for under the following circumstances:

A. **In Pregnancy.**—Narrow pelvis, haemorrhage, persistent vomiting, fever, fits, or any other abnormal condition that may be present.

B. **In Labour.**—1. If the midwife, when the cervix has become partially dilated, is unable to make out the presentation, or finds that no progress is being made.

2. In all presentations apart from normal, i.e. presentation of the after-birth, face, arm, shoulder, or cord; and of the breech or feet in primipara.

3. Haemorrhage of all kinds, i.e. if there is any loss of blood apart from what is natural, at whatever time of the labour it may occur.

4. Continuous pain and violent contractions of the uterus.

5. Whenever a tumour is felt in the mother's passages, or when there does not appear room for the child to pass.

6. Prolonged second stage, and any abnormality on the part of the mother.

7. If the placenta has not been expelled within an hour of the birth of the child.

8. In cases of rupture of the perinaeum, or other serious injury to the softer parts.

9. Rigors (p. 207), rise of temperature, increased pulse and respiration rate.

10. Collapse (p. 562).

11. Eclampsia, see below.

12. Diarrhoea (p. 186).

13. Local disease of any kind.

C. **During Lying-in.**—When the progress of mother or child is not satisfactory.

A. COMPLICATIONS OCCURRING DURING PREGNANCY

1. **Puerperal Eclampsia, or Convulsions.**—In this disease the fits or convulsions are similar in many respects to those which occur in epilepsy; but the disease is quite distinct from epilepsy. Apoplectic, epileptic, and hysterical fits may also occur in connection with child-birth, the description of which will be found under their respective headings (see Chapter IX, p. 362).

The following conditions are favourable to eclampsia: Kidney disease, rigidity of the soft parts, multiple pregnancy, retention of excretions for a lengthened period, obstructed delivery. Fits occurring before or at the commencement of labour are much more serious than when labour is advanced, they are also more common in first than in subsequent confinements. Symptoms prior to the onset: Severe headache, giddiness, impaired vision, tinnitus, pallor, puffiness of the face and hands, oedema of legs and labia, epigastric pain, sickness, sleeplessness, scanty urine, constipation, thirst.

These symptoms may precede the attack by some days or weeks, but frequently the fit comes on without warning.

Symptoms of the fit.—The face is at first pale, then becomes purple, the muscles of the face are drawn, then twitch, the head is turned to one side, the tongue protruded, the teeth clenched, the eyeballs roll; subsequently the muscles of the trunk and limbs are similarly affected, the thumbs are turned in over the palm of the hand. Respiration is stopped at first, then becomes short, irregular, and noisy. Foam appears at the mouth, often mixed with blood through biting the tongue. Consciousness is lost. (See also p. 362.)

Duration.—The fit may last one minute or a minute and a half, in severe cases the patient remains unconscious and the fits are constantly repeated. The temperature is usually high.

Management.—Pending the arrival of the doctor, the nurse must prevent the patient injuring herself. Loosen the clothing, place a teaspoon or toothbrush handle wrapped in a handkerchief between the teeth, prevent her rolling off the bed. When the fit is over keep the patient at perfect rest, place hot-water bottles in the bed and a warm blanket next to her to induce sweating. Get the bowels open and keep them freely so. Collect and test a catheter specimen of urine, and keep an accurate account of the amount passed in 24 hours. Give milk diet only, with the addition of plenty of hot water. Watch the patient carefully and do not leave her alone in case another fit occurs. Hot packs (p. 109), vapour baths (p. 113), hot-air baths (p. 112), or cupping (p. 104) may be ordered by the doctor, for application of which see Chapter III.

2. **Antepartum Haemorrhage.**—**Placenta Praevia** is far more common in the elderly multipara than in the primipara. Bleeding from this cause rarely starts when labour has commenced, but is present before the pains begin. It occurs usually in the thirtieth to thirty-sixth week, and the patient rarely goes to term.

Cause.—It is due to the placenta being situated low down in the uterus and either partially or wholly occluding the os; or a stretching and relaxation of the lower uterine segment causing a portion of the placenta to become detached. In the course of a week or two another haemorrhage occurs, and yet another, until the placenta gradually separates off; the portion of separated placenta acting as a foreign body stimulates the uterus to contract. The earlier, however, bleeding occurs in pregnancy, the less there is when labour begins, as often the placenta is practically separated and each area is thrombosed.

Diagnosis.—The characteristic symptom is sudden and unexpected bleeding without any adequate cause. The first bleeding may be so profuse as to cause extreme anaemia or even death; this is more apt to be the case when it occurs at, or near, full term. On vaginal examination the soft spongy placenta will be felt, the presenting part is high up and is not fixed, it is commonly a breech.

Prognosis is much more favourable for the mother than the child. The chief cause of mortality in the child is the separation of the placenta from the uterine wall, which cuts off its supply of oxygen; other causes are premature birth, and breech presentations (p. 707).

Management.—Whilst waiting for medical assistance, keep the patient lying down and warm. Do not give stimulants. See that everything is ready, so that when the doctor arrives no time will be lost.

With regard to treatment in the following conditions, the midwife should act as stated below until the arrival of the medical attendant. In a vertex presentation with labour well advanced, rupture the membranes, apply a tight binder, and give a dose of ergot. When a foot presents, rupture the membranes, pull the foot down and hold on to it until the arrival of the doctor. In cases where the presenting part cannot be felt and the haemorrhage is severe, plug the vagina effectually with a sterilized plug. Strips of clean linen or calico rendered sterile by boiling will do if the usual plugs are not at hand (p. 687).

3. **Accidental Haemorrhage.**—This is not nearly so common as placenta praevia. There are three varieties of accidental haemorrhage, viz. revealed, concealed, and combined. Revealed is by far the most common.

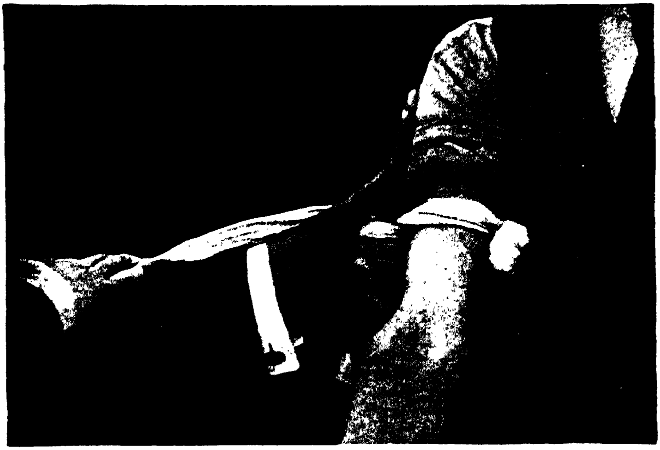
Cause.—Accident was thought to be the cause, hence the name, but careful observation has proved that it usually occurs in patients suffering from albuminuria (p. 236), chronic Bright's disease (p. 243), or heart disease (p. 267).

(1) In **Revealed Haemorrhage** the blood escapes from the uterus and flows away from the vagina.

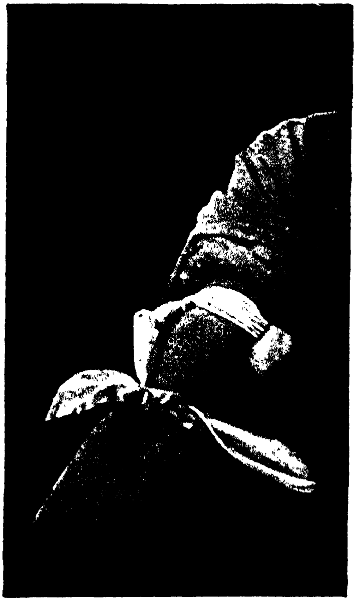
Management.—Send for medical assistance, and meanwhile apply a tight binder, give a dose of ergot, keep the patient at rest, and watch her carefully. If the haemorrhage is severe and the patient not in labour, give a hot vaginal douche (115°–120° F.) (p. 71); plug the vagina very firmly with sterilized gauze or wool and apply an antiseptic pad to the vulva and T-bandage. If the haemorrhage is severe and the patient in strong labour, rupture the membranes.

(2) In **Concealed Haemorrhage** the blood poured out from the placental site is pent up in the uterus, and nothing is seen externally. This is a very serious condition, and is caused by paralysis of the

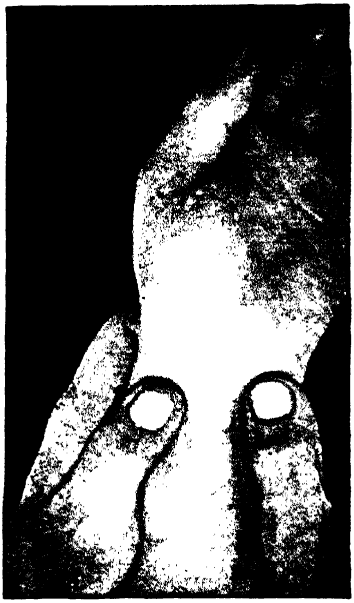
PLATE XXXIII · TOURNIQUETS



A. Tourniquet applied to the brachial artery. The stick is placed in the knot ready to tighten the bandage.

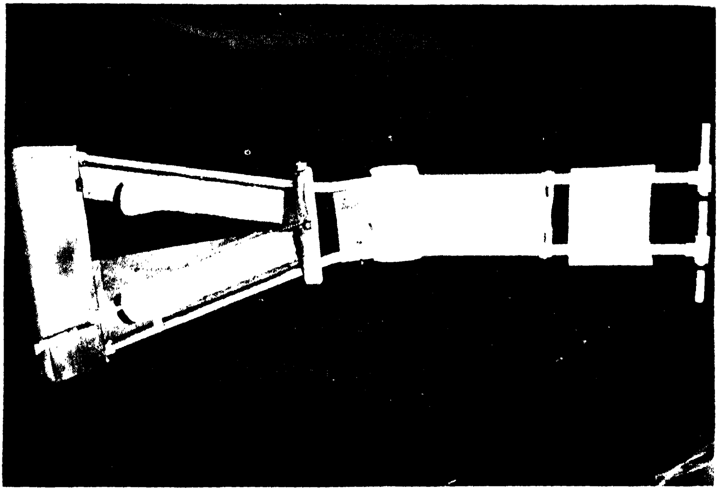


B. The tourniquet has been tightened, and the stick is secured by the free ends of the bandage.

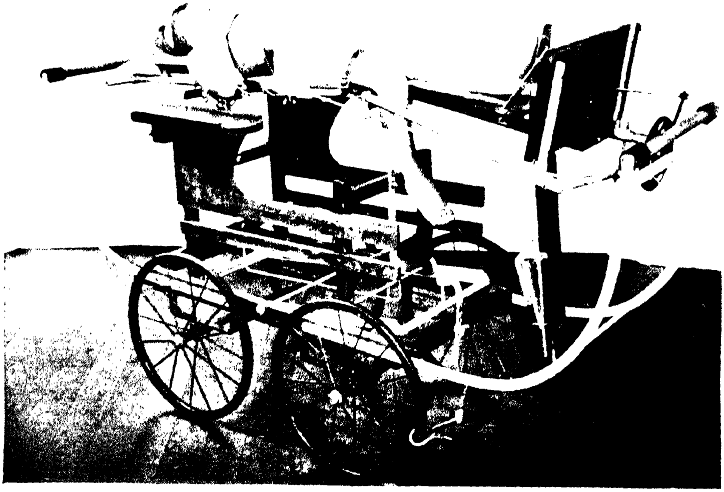


C. Compression of both arteries at the wrist.

PLATE XXXIV · PUGH'S HIP FRAMES

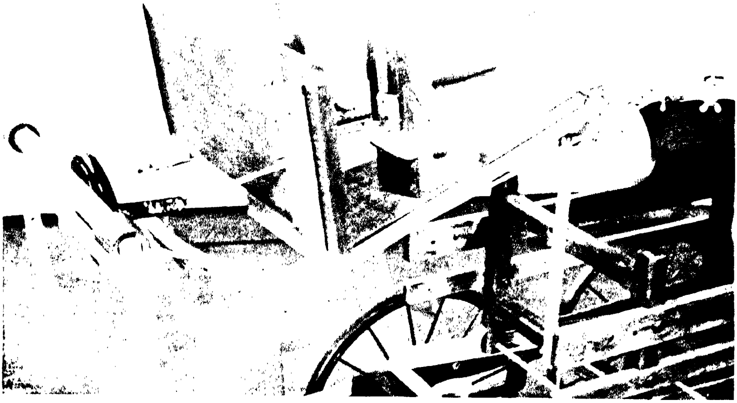


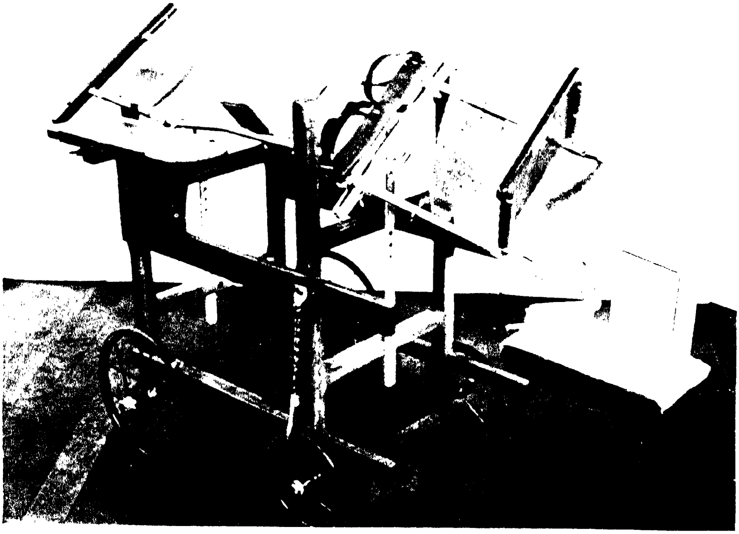
A. Pugh's frame [illegible]



B. Pugh's hip frame and carriage. The sound limb is being exercised

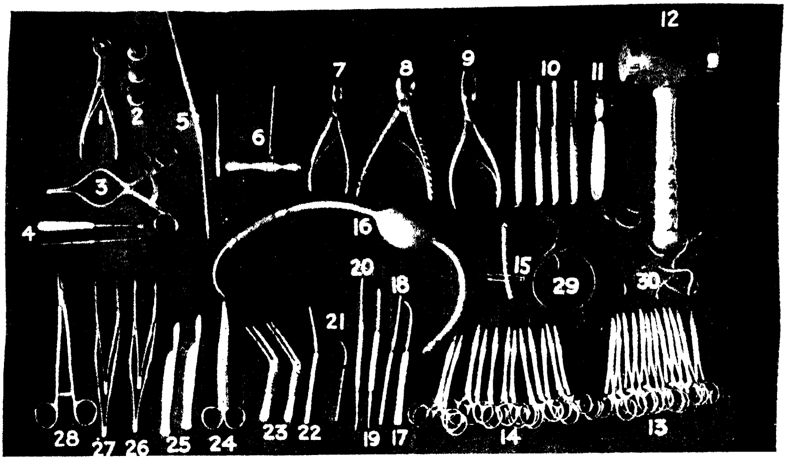
PLATE XXXV • PUGH'S HIP AND SPINAL FRAMES





B. Pugh's spinal frame and carriage, showing limit of rotation of frame; also, on the stool, the bedpan tray and holder.

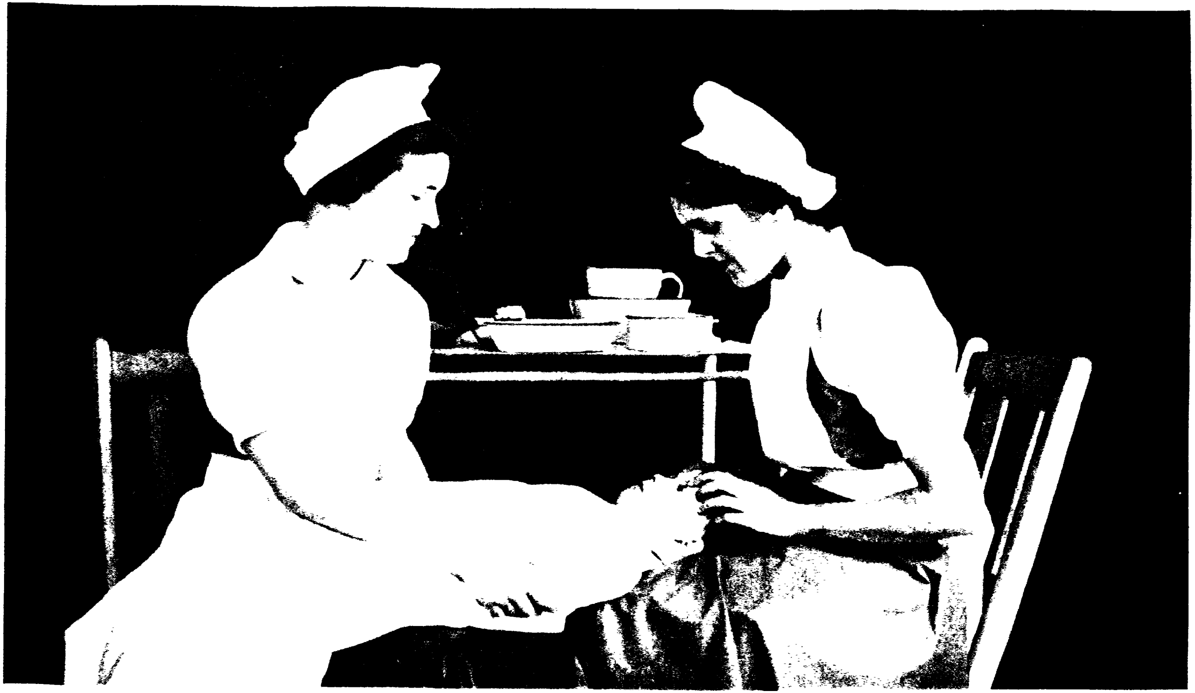
PLATE XXXVI · MASTOIDECTOMY · IRIDECTOMY



Instruments for Mastoidectomy: 1, aural speculum (dilating); 2, aural specula; 3, Mollison self-retaining retractor; 4, St Clair Thompson finger retractors; 5, sucker; 6, Macewen's burrs; 7 and 8, bone-nibbling forceps; 9, Janson's bone forceps; 10, set gouges; 11, Farabeuf's rugine; 12, wooden mallet; 13, twelve 5" Dunhill's curved artery forceps; 14, twelve 5" Spencer Wells artery forceps; 15, drainage tube; 16, Higginson syringe and cannula; 17, Eustachian probe; 18, aural curette; 19, seeker and guide; 20, Heath's dissector; 21, Staecke's guide; 22, Grant's hook; 23, aural forceps; 24, Mayo's scissors; 25, scalpels; 26, Lane's toothed dissecting forceps; 27, plain dissecting forceps; 28, Joly needle holder; 29, silkworm gut on half circle cutting needle; 30, No. 1 catgut on half circle cutting needle.

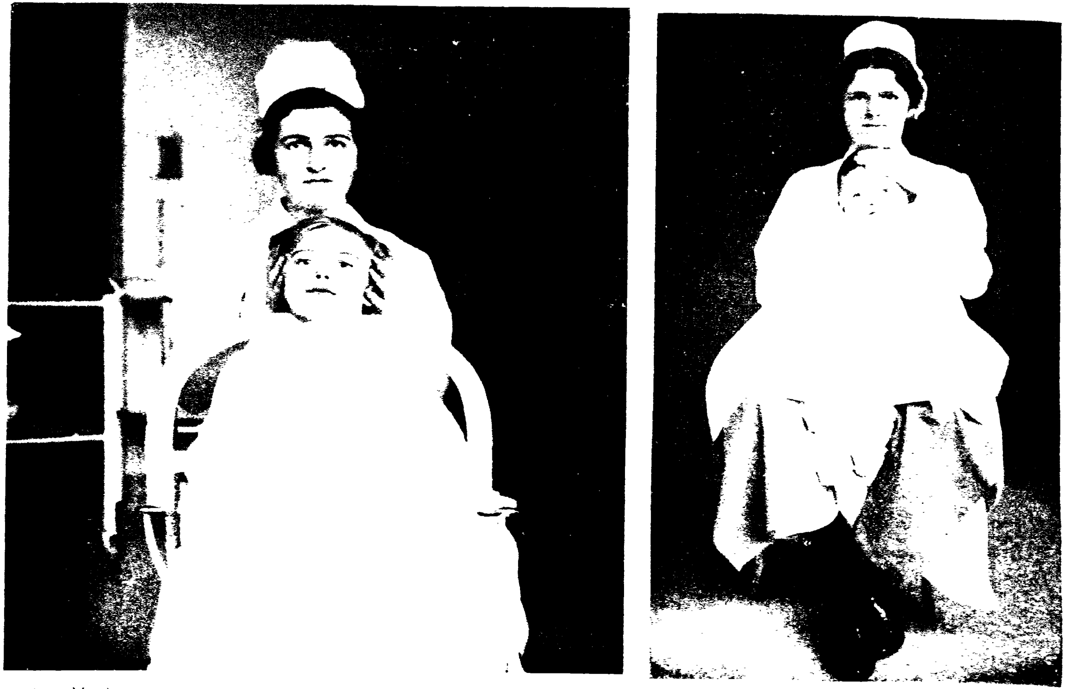
Instruments for Iridectomy: 1, novocaine 4 per cent; 2, two-c.c. record syringe and needle; 3, Silcock's needle-holder and eye curved needle and No. 1 black silk suture; 4, bulldog clip; 5, cross-action towel-clip; 6, eye speculum; 7, conjunctival forceps; 8, fixation forceps; 9 and 10, straight and curved keratomes (iridectomy knives); 11, iris scissors (De Weeker's); 12, curved iris forceps; 13, straight iris forceps; 14, iris repositors; 15, dissecting forceps; 16, iris scissors; 17, blunt-ended scissors; 18, funnel; 19, undine and rubber tubing; 20, cannula for anterior chambers washout; 21 and 22, drop bottles (atropine and cocaine); 23 and 24, receiver and measure; 25, wire eye-guard; 26, eye bandage (Moorfields'); 27, single eye pad; 28, double eye pad; 29, tetra swab; 30, gauze swab; 31, fast edge 2" bandage; 32, rasco clip.

PLATE XXXVII · HOLDING AN INFANT FOR EYE TREATMENT



Method of holding an infant for the application of treatment to the eyes.

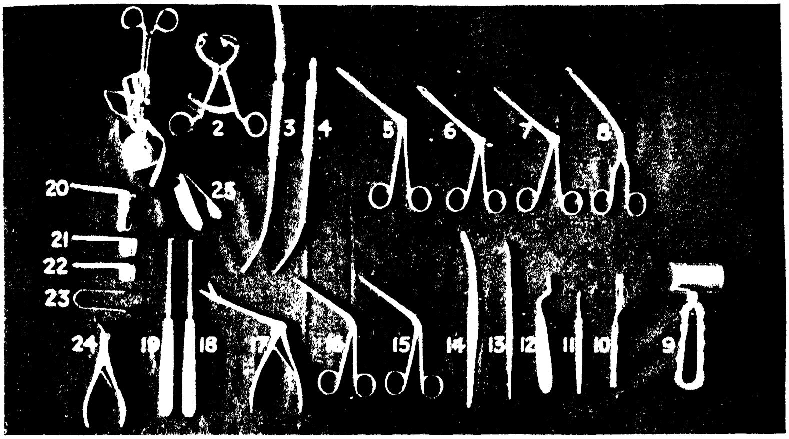
PLATE XXXVIII · HOLDING A CHILD FOR EXAMINATION OF NOSE AND THROAT



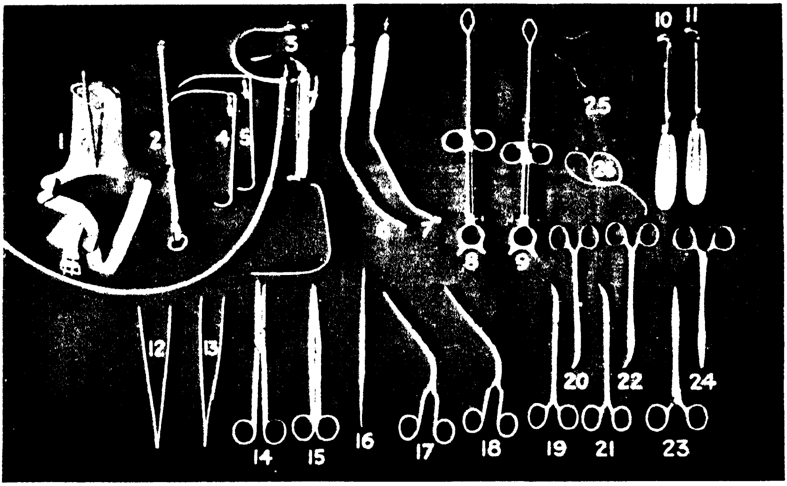
A. [illegible] examination of the

B. [illegible]

PLATE XXXIX · RESECTION OF SEPTUM · TONSILLECTOMY

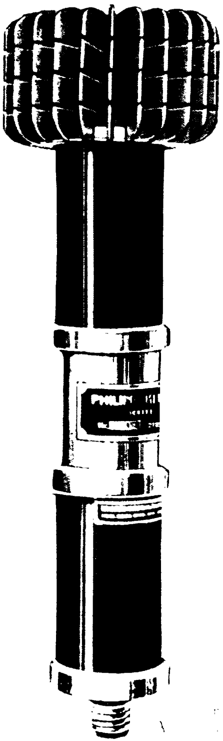


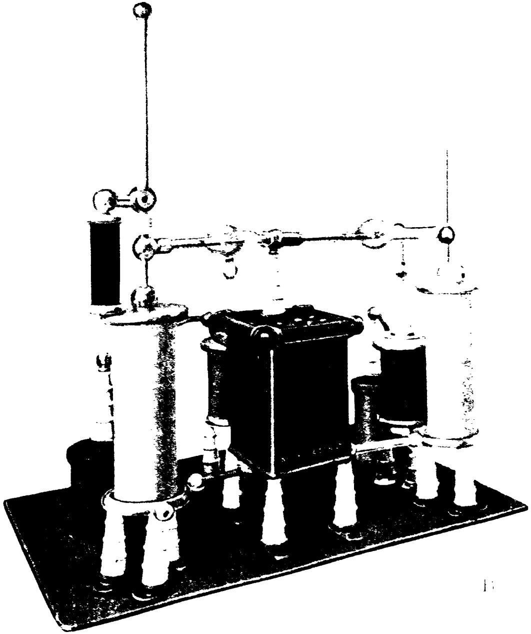
Instruments for Submucous Resection of Septum: 1, post-nasal sponge on holder; 2, [illegible] gag; 3 and 4, sucker ends; 5, Pain's nasal polypus forceps; 6 and 7, Hartmann punch forceps; 8, Luc's forceps; 9, Heath's mallet; 10, Killian's gouge; 11, septum knife; 12, Killian's dissector; 13, Heath's dissector; 14, Hill's dissector; 15 and 16 nasal dressing forceps; 17, Struycken nasal scissors; 18 and 19, Ballenger's swivel knives; 20, St Clair Thompson's nasal speculum; 21, 22, 23, Tilley's nasal specula; 24, dilating nasal speculum (Killian's); 25, Lake's indiarubber nasal splints.



Instruments for Tonsillectomy: 1, 2, 3, suspension apparatus (Boyle-Davis gag); 4 and 5, spare tongue depressors (Boyle-Davis gag); 6 and 7, sucker ends; 8 and 9, tonsil snares; 10 and 11, adenoid curettes; 12, Waugh's toothed dissecting forceps; 13, Waugh's plain dissecting forceps; 14, long curved on-the-flat scissors; 15, long straight Mayo's scissors; 16, Heath's tonsil dissector; 17 and 18, Luc's forceps; 19, 20, 21, 22, curved artery forceps; 23 and 24, straight cutting forceps; 25, No. 0 chromic catgut ligature; or 26, No. 40 thread ligature.

PLATE XI · RAYPROOF TUBE · X-RAY UNITS


A


B

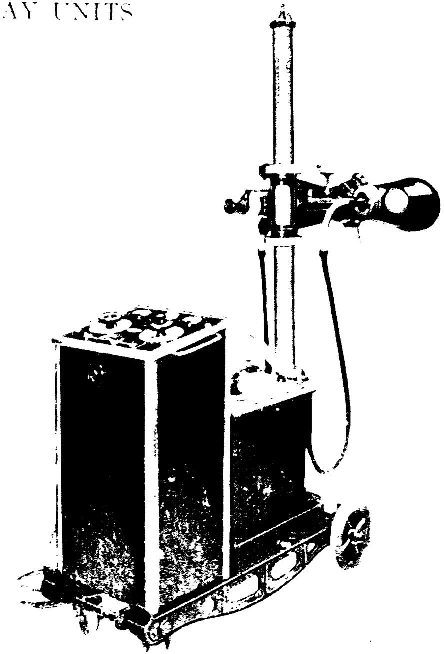


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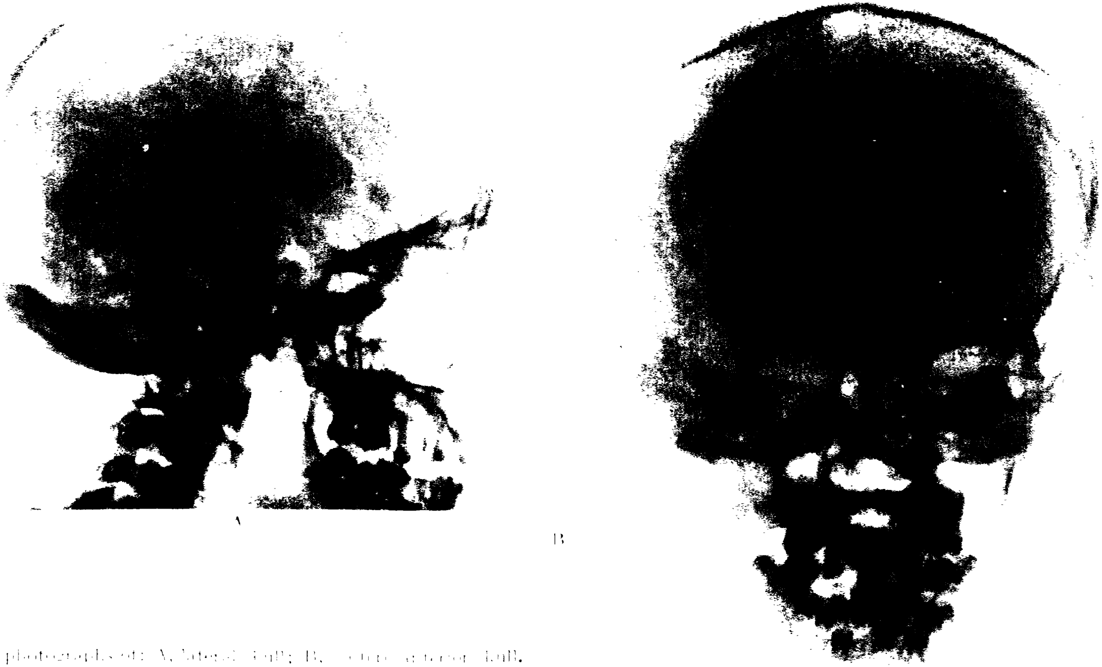
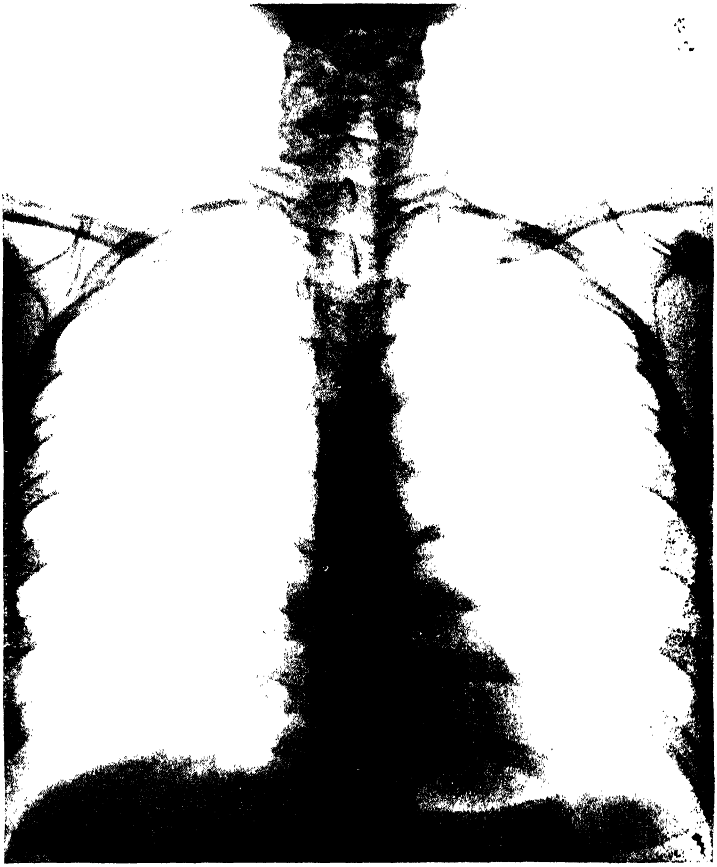
PLATE XLI · LATERAL AND POSTERO-ANTERIOR SKULL



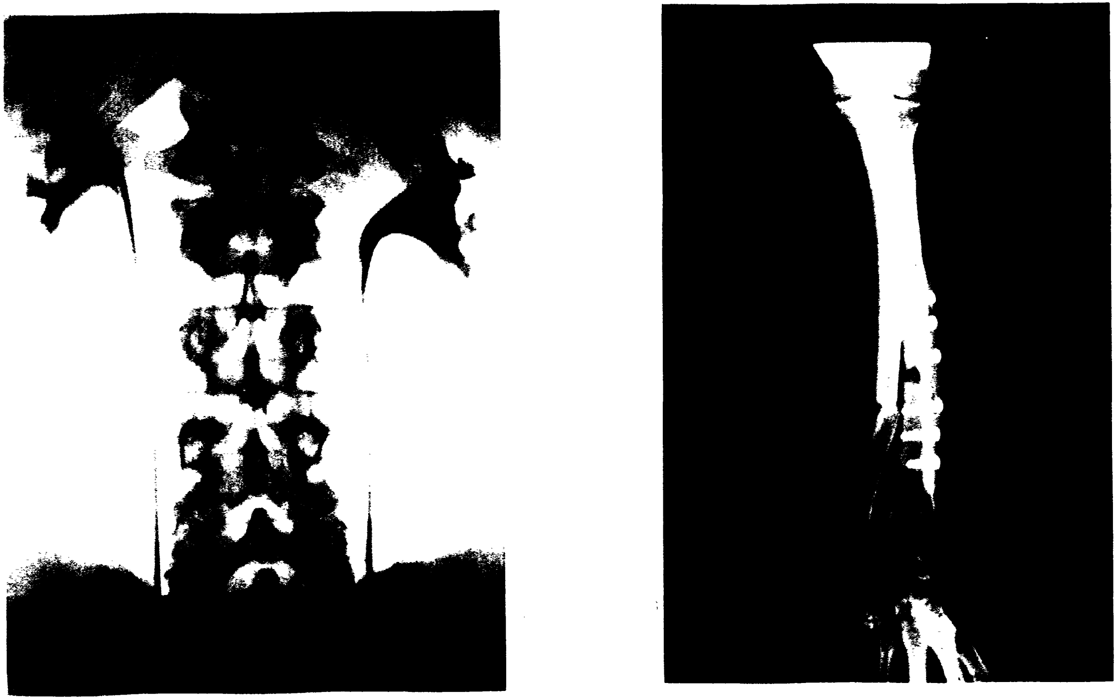
X-ray photographs of: A, lateral skull; B, postero-anterior skull.

PLATE XLII THORAX



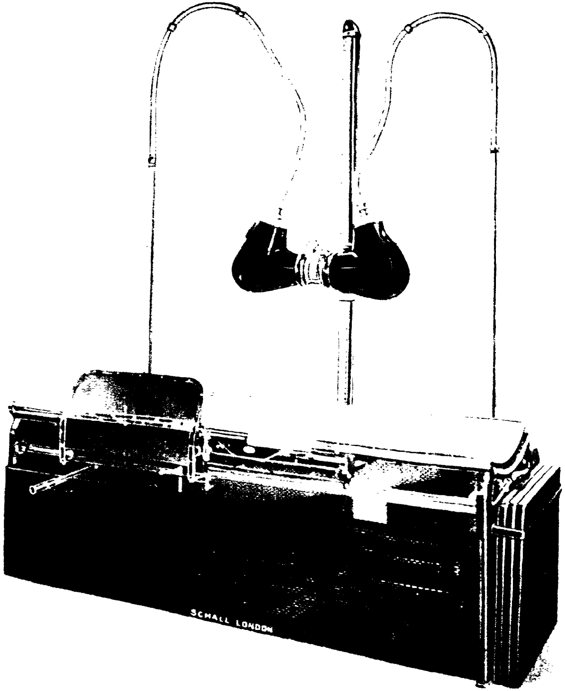
X-ray photograph of thorax, showing heart and lungs, etc.

PLATE XLIII · PYELOGRAM · BONE GRAFT

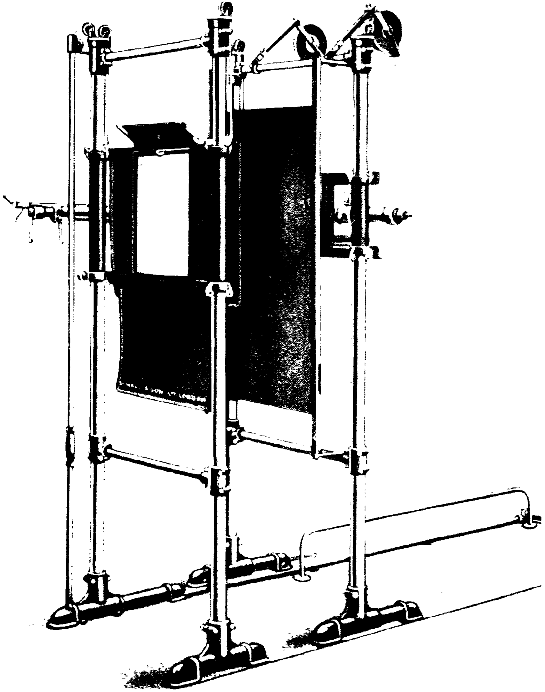


X-ray photographs of [illegible] radius.

PLATE XLIV.—COUCH AND SCREENING STAND

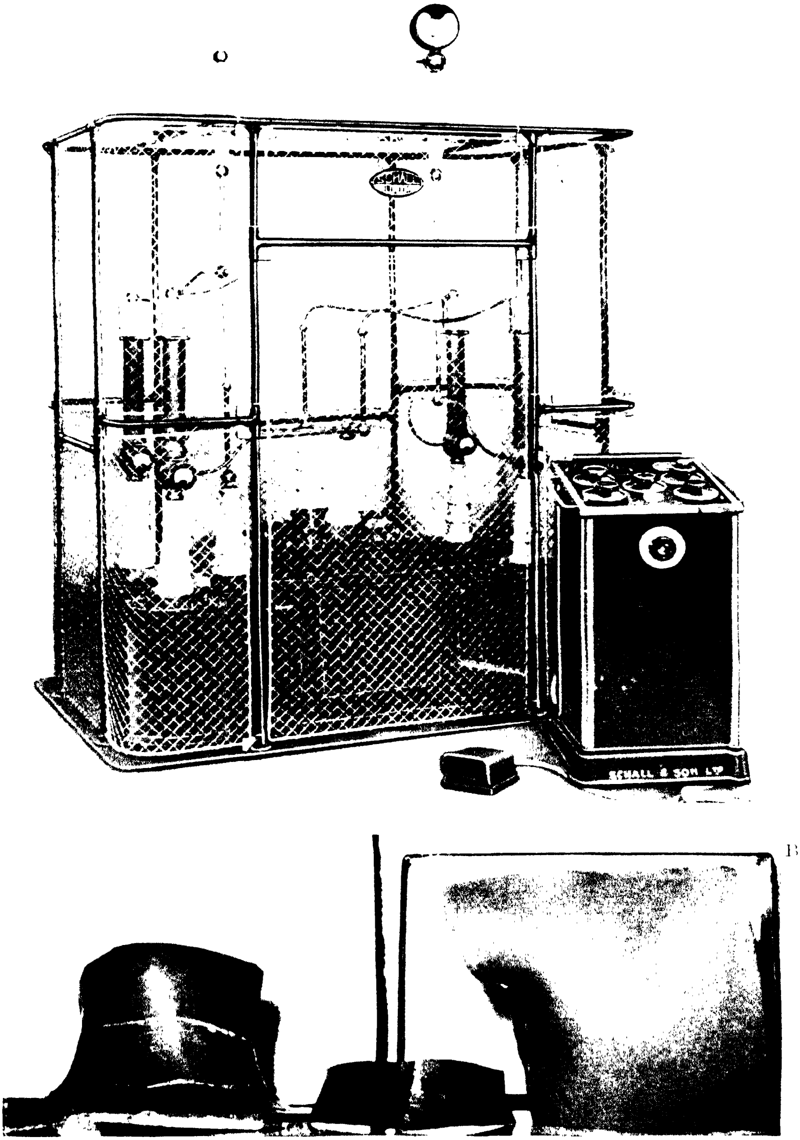


A. X [illegible]



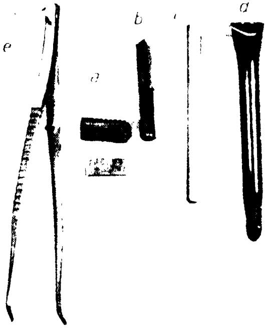
B. X [illegible]

PLATE XLV · THERAPY UNIT · APPLICATORS



A (*above*), deep X-ray therapy unit; and B (*below*), Columbia paste applicators moulded to fit the patient, with the area which is to be loaded marked out.

PLATE XLVI · APPLICATORS



A. The inner surface of the application; the [illegible] have been [illegible] and [illegible].

B. Application being worn.

C. *a.* Intra[illegible] applicator.

Intra-oesophageal applicator [illegible]:

b. Inner tube containing radium.

c. The complete oesophageal tube.

d. Symonds' feeding tube.

e. Grooved forceps.

D. Todd's intrarectal applicator.

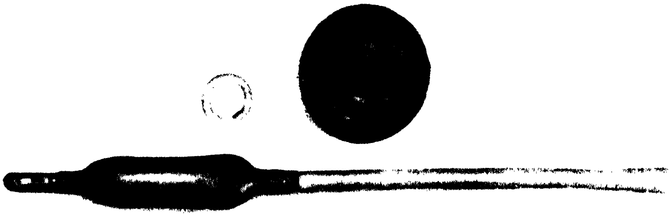
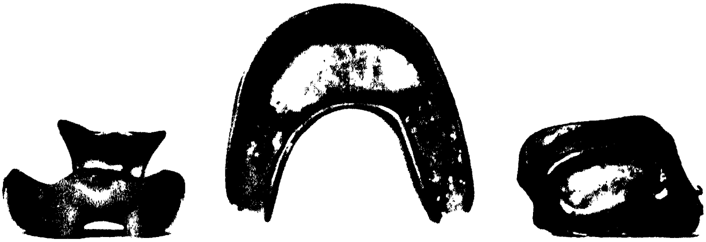
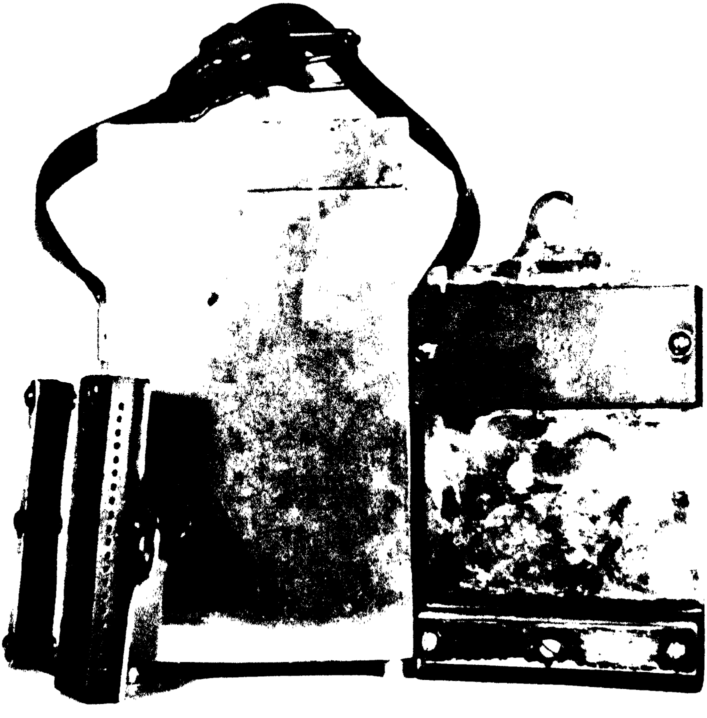


PLATE XLVII DENTAL PLATES · METAL CONTAINERS · NEEDLE CARRIERS





A. Dental plates, showing the boxes into which the radium is packed.

B. Metal container, with carriers for radium needles, when prepared for interstitial use.

uterus from a sudden large haemorrhage; the bleeding continues until the muscular fibre has reached its limit, then the tension stops it. Pains are absent, or the blood would track along.

Symptoms.—The patient becomes pallid, restless, thirsty, has air hunger (p. 205), the pulse is rapid and weak, temperature subnormal. Shock and collapse are present (p. 562). The abdomen becomes larger and more tense, and is very tender.

Management.—Send for medical assistance, meanwhile keep the patient lying down, apply a tight binder. Any attempt by the midwife to deliver the patient would be fatal. Prepare for an abdominal operation (p. 505). The doctor may do one of two things, either give the patient morphia or open the abdomen. If morphia is given, the patient may recover from shock and the pains start. If the abdomen is opened, either a Caesarian operation is performed or a hysterectomy (p. 510).

4. **Abortion** is the term used when the ovum has been expelled before the fourth month or before the placenta is formed.

(1) In **Threatened Abortion** part of the ovum becomes detached from the uterine wall, but is living and capable of going on to full term.

Predisposing causes.—Misplacements or tumours of the uterus, constipation, unhealthy ovum or uterus.

Actual causes.—A shock, fall, blow, or violent exertion on the part of the patient.

Management.—Send for the doctor. Meanwhile if the case is one of threatened abortion, which is marked by slight bleeding, slight pain, and the os is not dilated, put the patient to bed, keep her quiet, and watch her carefully. These patients are usually constipated, but aperients are not generally ordered, or if so, only those that will cause an easy action of the bowels. If an enema is ordered, it is advisable to give it by allowing the water to flow in by gravity instead of using a Higginson syringe (p. 60). The patient is kept in bed for at least five days after haemorrhage and pain have ceased.

(2) An **Inevitable Abortion** is marked by the patient suffering severe haemorrhage and pain, and if a vaginal examination is made the os will be found to be dilated, and probably the ovum presenting.

Management.—Whilst waiting for medical assistance, give the patient a hot vaginal douche (p. 73) (115°-120° F.), and if this fails to stop the haemorrhage, plug the vagina with sterilized gauze or wool (p. 688).

5. **Miscarriage.**—The term used when the foetus has been expelled any time after the placenta is formed, and before the child is viable.

Management.—Send for a doctor, meanwhile put the patient to bed and keep her at rest. The patient is kept at rest in bed for ten days or a fortnight after.

Full-term Birth.—The term used to indicate that the child is born at the end of the tenth lunar month, or the ninth calendar month.

Premature Birth.—The term used to indicate that the child is born between the seventh and ninth months.

An **Anencephalic Foetus** may be born, that is, a deformed and brainless monster. They are often very misleading and startling to the midwife unless their nature is recognized at once, especially with a head presentation.

B. Complications occurring during Labour

The patient should be kept in bed during the first stage of labour when any of the following conditions are present: Swelling of the limbs; haemorrhage; disease of the heart, kidneys, and lungs (Chapter VII); malpresentations; hydramnios (p. 692); multiple pregnancy; prolapse of cord; pendulous abdomen; umbilical hernia (p. 495); haematoma of the vulva; history of precipitate labour; early rupture of the membranes; undue relaxation of the soft parts.

The binder should be applied before delivery under the following circumstances: Multiple pregnancy; pendulous abdomen; umbilical hernia; haemorrhages; contracted pelvis; hydramnios; uterine inertia in the second stage (p. 709); obliquity of the uterus; after version has been performed. The reason for applying the binder in these cases is to keep the uterus in its proper position and to help the abdominal muscles in expelling the child. The binder must be pinned from above downwards.

Method of applying the binder.—The binder should be made of some strong material such as unbleached linen or strong towelling, doubled lengthwise; it should measure 1¼ yards in length and 18 inches in width.

The safety-pins are inserted as follows, pinning from below upwards when applying the binder after confinement, and from above downwards when the binder is applied before delivery: First pin, about 3 inches below the great trochanter; second pin, about 3 inches below the top of the hip bone; third, on a level with the fundus of the uterus; fourth, at the top of the binder, this part of the binder should not be pinned too tightly.

Version consists in changing the position of the child in the uterus and may be performed for the following conditions: (1) Transverse, face, and brow presentations, (2) placenta praevia, (3) in some cases of contracted pelvis and prolapse of cord.

Preparation.—When version is to be performed, prepare a douche (p. 70), also a binder, and two towels which are used as pads to keep the child in position.

1. (*a*) **Presentation of the Cord** is the term used to indicate that the cord is in front of the presenting part, and can be felt through the unruptured membranes.

(*b*) In **Prolapse of the Cord** the cord falls when the membranes rupture, a loop may be felt in the vagina, or it may protrude outside the vulva. Presentation and prolapse of the cord may occur in any condition in which the child does not fill the lower uterine segment, thereby leaving a space for the cord to slip past. The chief of these conditions are: Contracted pelvis; hydramnios; transverse, breech, and brow presentations; very long cord; twin pregnancy; battledore placenta. Prolapse of the cord is a dangerous condition to the child, but not so to the mother.

Management.—Send for medical assistance, meanwhile avoid making vaginal examinations, and instruct the patient not to ' bear down.' Place her in the genu-pectoral position (see p. 678, Fig. 253) as in this posture the fundus of the uterus becomes the lowest part and the os the highest, consequently the cord sinks to the fundus. In order to relieve pressure, the patient should lie on the side on which the cord has come down in a vertex presentation, and on the opposite side in a breech. A douche is prepared in case the doctor performs version, or delivers by forceps. Two baths should also be in readiness in case the child is born asphyxiated (p. 708); one bath is cold, the other at a temperature of 100° F.

2. **Breech Presentation.**—*Breech presentations* are more dangerous to the child than the mother. In managing a breech labour the membranes should be kept intact as long as possible; therefore, the patient is kept at rest in bed and as few vaginal examinations made as necessary. When the membranes rupture, a vaginal examination should be made to see if the cord has prolapsed. The foetal heart sounds are listened for and counted at frequent intervals. The bladder must be kept empty. For delivery the best plan is to place the patient in the dorsal position (p. 676), with the knees well drawn up. No interference is necessary until the child is born as far as the umbilicus. Cover the breech with a warm sterilized towel. Draw down a loop of the cord, and if it is pulsating normally wait for the shoulders to be born, then grasp the child by the pelvis, rotate the occiput under the pubic arch, carry the body forward as the head is born, keeping good supra-pubic pressure with the other hand. If when the cord is brought down it is found to be pulsating feebly, the child should be delivered as speedily as possible; the most natural and satisfactory way to accomplish this is by pressure on the

fundus. Should this method fail, gentle traction should be made on the body of the child. If the arms become extended, they must be brought down before the delivery of the head. To bring down the arms, draw the child's body towards the mother's abdomen, then pass one hand into the vagina and feel for the posterior arm. If it is bent, pass two fingers above the elbow, and draw them gently over the chest. If the whole arm is extended, pass the fingers above the shoulder and gently sweep the child's arm over its face and chest. The anterior arm should then be brought down in the same way, or it may be rotated into the hollow of the sacrum and then brought down. When the arms are born the head must be delivered as speedily as possible by one of the following methods:

(1) *Prague method.*—Catch the child's shoulders on each side with the fingers of the left hand. Hold the feet with the right hand, and draw the legs upwards over the mother's abdomen, at the same time with the left hand draw the shoulders forward; the head will then sweep over the perinaeum.

(2) *Smellie's method.*—Place the child's body across the right arm. Insert the fingers into the vagina and feel for the mouth, into which pass two fingers as far back as possible. Place two fingers over the shoulders as in the previous method, and draw, first downwards and backwards, then downwards and upwards, bringing the child's feet over the mother's abdomen, and the head will be born.

3. **Twin Pregnancy.**—*Danger to the mother.*—The uterus being larger than in a single pregnancy, the walls are thinner, the pains consequently weaker, and labour may be delayed. Inertia may continue after the second stage is ended and cause post-partum haemorrhage, or haemorrhage may occur from a very large placental site.

Danger to child.—The heads may become locked, or the cords twisted or prolapsed, malpresentations are common.

Management.—Put the patient to bed, and keep the membranes from rupturing in the first stage. The birth of the first child is usually natural, though labour may be tedious. Ascertain the position of the second child; if it is normal, wait half an hour, then rupture the membranes if still intact, and proceed as in a single pregnancy. On examination, should the child prove to be in an oblique or transverse position, send for the doctor at once. There is danger of haemorrhage occurring during the third stage. The fundus should be very carefully controlled, and for a much longer time than in a normal case. To favour the permanent contraction of the uterus, one drachm of ergot, pituitrin 5 units, or subcutaneous injection of ergotine is administered on completion of the third stage.

4. **Uterine Inertia** is a condition in which the uterus is deficient in contraction and retraction.

(1) **Primary Inertia** occurs when the labour pains are weaker and slower than normal, and may be caused by hydramnios, twins, large child, weak muscular fibres, debility, full bladder and rectum.

Management.—Empty the bladder and rectum, give the patient suitable food, induce sleep. Stimulate the uterus to contract by rubbing the fundus, and apply a binder if the abdomen is pendulous (p. 706).

(2) **Secondary Inertia** is a condition in which the contractions of the uterus become weak and feeble, then cease altogether; although they were normal at first. The causes may be distended bladder, loaded rectum, rigid soft parts, obliquity of the uterus, contracted pelvis, abnormally large size of child's head, the patient becoming tired and exhausted.

Management.—Let the patient rest and get her to sleep; if possible, remove the cause. When the patient is rested the pains will probably start with renewed strength. This condition is not dangerous before the membranes rupture, but in the third stage is exceedingly so, being the chief cause of post-partum haemorrhage.

5. **Rigidity of the Soft Parts** may be remedied by hot baths and douching (p. 71).

6. **Threatened Rupture of Uterus.**—*Symptoms.*—Marked rise of temperature and pulse, continuous painful contraction of the uterus, Bandl's ring (p. 692) felt, distressed anxious expression, sordes (p. 15) on lips, and hot and dry vagina.

7. **Ruptured Uterus.**—*Symptoms.*—The patient complains of something having given way internally, labour pains cease, and if the presenting part be not fixed it will recede. Haemorrhage, collapse, fall of temperature, rapid pulse, and severe abdominal pain occur (see perforation, p. 518).

Management.—Get medical aid as quickly as possible, and meanwhile treat the patient for collapse (p. 562). Prepare for an abdominal operation (p. 505).

8. In **Inversion of the Uterus** the uterus is partially or completely turned inside out; it is a rare complication.

Symptoms.—Severe haemorrhage, collapse; on examination, instead of feeling the rounded fundus beneath the hand, a cup-like depression is felt.

Management.—Send at once for the doctor, treat the patient for collapse, prepare a douche (p. 70).

Causes.—Pulling on the cord when the uterus is flabby, trying to express the placenta in the absence of a contraction, or severe straining on the part of the patient.

9. **Contracted Pelvis** is one which is smaller, in any of its diameters, than normal.

Causes.—Small stature and narrow hips, pendulous abdomen, bandy legs (p. 621), humpback, osteomalacia (p. 301).

Symptoms.—When the patient is in labour the presenting part will not be fixed, the membranes protrude in a cone shape, the presenting part is high up, the promontory of the sacrum is felt with ease, the diagonal conjugate is shortened.

Management.—Send for the doctor, meanwhile prepare the patient for an anaesthetic (p. 446), and prepare for an abdominal operation in case it is necessary to perform a Caesarian section (p. 511).

C. COMPLICATIONS OCCURRING AFTER LABOUR AND DURING LYING-IN

1. **Post-partum Haemorrhage** is haemorrhage occurring after the birth of the child, in sufficient quantity to cause constitutional symptoms. It may be divided into two kinds, viz.:

(*a*) **Atonic**, when due to deficient contraction and retraction of the uterus.

(*b*) **Traumatic**, which is due to tears and injury to the soft parts. It is called primary haemorrhage when it occurs within 6 hours of the birth of the child, and secondary when it occurs after this time; it may be internal or external.

Causes.—Uterine inertia, retained membranes, pieces of placenta or blood-clot; hour-glass contraction of the uterus; multiple pregnancy; hydramnios; abnormally rapid or prolonged labour; inversion of the uterus; distended bladder; laceration of the soft parts. The majority of cases of post-partum haemorrhage are atonic.

(*a*) **Atonic Post-partum Haemorrhage.**—*Management.*—Ascertain if the uterus is well contracted, and if not, apply massage and gentle pressure downwards until it contracts firmly. If the bladder is distended, pass a catheter (p. 66). If the placenta is still in the uterus, try to express it (p. 696). Should the haemorrhage still continue, and having failed to express the placenta, give a hot vaginal douche (p. 73) (115°-120° F.). If this fails to check the haemorrhage, if the patient's life is in danger, and if medical assistance cannot be obtained, having taken the usual antiseptic precautions (p. 431), pass the hand into the uterus and remove the placenta manually. After this give an intra-uterine douche (p. 71), and massage the uterus. Give one drachm of ergot in water, and repeat in half an hour, or pituitrin 5 units subcutaneously. Should haemorrhage still continue, anteflex the uterus, or compress the abdominal aorta until medical assistance is obtained. (For general treatment of haemorrhage see p. 563.)

(*b*) **Traumatic Haemorrhage** may be distinguished from atonic in that the uterus is well contracted, and the haemorrhage is continuous and does not come away in gushes.

Management.—Examine the vulva and endeavour to see from where the blood is flowing. If the bleeding point can be seen, apply pressure with a sterilized pad of wool or gauze. If it still continues, give a hot vaginal douche and reapply pressure until medical assistance is obtained. The haemorrhage having been checked, the collapse due to loss of fluid from the body should be treated (see haemorrhage, p. 512).

2. **Puerperal Sepsis.**—This condition includes the following forms of sepsis which may occur during lying-in: Sapraemia, septicaemia, pyaemia, parametritis, phlegmasia dolens, pulmonary embolism, puerperal ulcer.

3. **Sapraemia** is a toxic condition produced by the absorption of the products of decomposition.

Cause.—Decomposition is brought about by germs gaining access to the uterus in the third stage of labour, when the uterus has not been thoroughly emptied and contains pieces of membrane, placenta, or blood-clot, these organisms living only on dead tissues.

Symptoms.—Rise of temperature, about 101°-102° F., occurring about the third day, but it may be earlier or later. Headache, disinclination for food, feeling of illness, rise of pulse. Offensive lochia (p. 697). The tongue is furred, and the uterus bulky in cases in which that organ has become infected; this does not hold good in cases of infection of the perinaeum.

Management.—The patient should be raised into the Fowler position (p. 25) in order to assist in draining away all discharges; if this position is impossible, raise the head of the bed on 8-inch blocks. Pituitrin or ergot is generally ordered in order to help the uterus to contract and expel the clot or tissue; for the same reason the uterus should be well massaged. The bowels must be kept freely open. Plenty of good nourishing food should be given, a stimulant is generally ordered. Drainage of the uterus is obtained by the injection of glycerine. A sterile graduated terminal-eyed catheter is passed into the os uteri by means of an introducer, a Record syringe filled with glycerine (sterile) is attached to the end of the catheter and the glycerine slowly injected. Vaginal douches may be ordered, but should not be given without orders. If the temperature remains high, the doctor may give an intra-uterine douche (p. 71), and if this fails to clear the uterus, it may have to be curetted (p. 681). Once the decomposing tissue is evacuated the patient usually makes a rapid recovery. Sulphonamide, or one of its preparations, e.g. Sulphathiazole, Sulphapyridine (M & B 760) (p. 776), is most effectual in checking the growth of organisms in all forms of puerperal sepsis.

4. **Septicaemia** is a form of blood poisoning brought about by infection by organisms which invade and live on the patient's tissues, and get into the blood stream. They are introduced by means of the attendant's hands, or instruments, or anything used during labour which has not been rendered sterile. The symptoms appear about the fourth day, or earlier. (For symptoms and treatment see p. 575.) The patient should be raised in the Fowler position, or the head of the bed should be raised on 8-inch blocks.

5. **Pyaemia** is a condition resulting from septicaemia, it is a septicaemia which has attempted to cure itself and failed. (For symptoms and treatment see p. 577.)

6. **Parametritis** is an infection of the broad ligament, brought about through an infected tear of the cervix. The symptoms appear the day the patient gets up. (For symptoms and treatment see p. 683.) Spread of infection upwards from the uterus may give rise to salpingitis (p. 683), pyosalpinx, ovarian abscess, or pelvic peritonitis.

7. **Phlegmasia Dolens,** or white leg, is the result of a mild infection of the peritoneum with clotting in the blood-vessels and lymphatics of the broad ligament. The clots spread along the internal and external iliac veins which extend to the femoral vein. When the two veins become infected, white leg results.

The *symptoms* are always late; occurring from the 10–14th day. The onset is sudden, with a slight rise in temperature. In a typical case the leg is large, white, firm, and extremely tender. It looks oedematous (p. 190), but in many cases does not pit, solid oedema being present. (For treatment see thrombosis, p. 281.)

8. **Pulmonary Embolism.**—See p. 283.

In any case of puerperal sepsis the mother should not suckle the child.

9. **Puerperal Insanity** is madness occurring after the birth of the child. (For symptoms and treatment see Chapter X.) In these cases the child must not be nursed by the mother.

10. **After-pains.**—These are pains which occur after delivery, and are due to blood-clots remaining in the uterus. To prevent them the uterus should be carefully massaged after delivery in order to leave it empty. Should they occur in spite of this, get the patient to pass urine, massage the uterus, apply a warm pad, and tighten the binder. Put the child to the breast; this will increase the pains

at first, but will diminish them subsequently. Other pains may occur after delivery due to constipation or inflammation. If due to constipation, they will disappear when the bowels are opened. If due to inflammation, the abdomen is exceedingly tender, pressure increases the pain, and there will be a rise of temperature and pulse-rate. An oil and turpentine enema (p. 62) may be ordered for this, also turpentine stupes or fomentations to the abdomen. (See p. 90.)

11. **Lactation.—Inflammatory Affections of the Breasts.**—The full establishment of milk usually occurs about the third day after delivery. In some cases it is not marked with any special disturbance, while in others it may be a source of some trouble.

Management.—If the breasts become distended and painful, a breast pump (Fig. 260) may be used to relieve tension, or the efforts of the child may be supplemented by the nurse gently rubbing the breast with warm oil. The rubbing should be continued until the milk flows freely, and should be directed from the circumference of the breast towards the nipple. If the weight of the breasts causes pain, they should be suspended by passing a piece of broad bandage under each breast and pinning it on the opposite shoulder. Hot stupes (p. 90) are a great comfort and give considerable relief. A saline aperient should be given and the fluid diet lessened. If there is any redness, acute pain, throbbing, or swelling (mastitis), the doctor must be told, as an abscess may form. If this is the case, the child must be taken from the breast. If in spite of every endeavour to keep them clean, the nipples become soiled and cracked, the doctor must be told, as neglected cracks or sores on the breasts may lead to an abscess. A nipple shield (Fig. 261) should be used when the child is nursed, or if they do not heal, the child should be taken from the breast for a time. If the nipples are badly formed, the mother should be taught to draw them out occasionally with clean fingers, or an older child should be put to the breast.

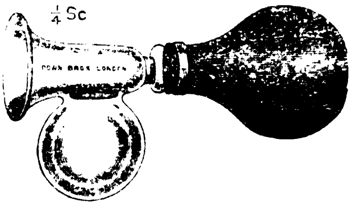


FIG. 260. Breast pump.

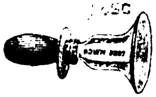


FIG. 261. Nipple shields.

COMPLICATIONS OCCURRING IN THE CHILD

1. **Asphyxia Neonatorum** is of two kinds: White asphyxia, or *asphyxia pallida*; blue asphyxia, or *asphyxia livida.*

(*a*) **White Asphyxia.**—In this form, which is the more dangerous, the child is white all over when it is born; there are no pulsations in the cord, no attempt is made to breathe, and the child is limp.

(*b*) **Blue Asphyxia.**—The child is blue, the cord pulsates, attempts are made to breathe, and the child is not limp.

(*a*) **White Asphyxia.**—*Management.*—In the absence of medical assistance, the cord should be tied and divided immediately, all mucus removed from the mouth and nose, and the child placed in a hot bath (temperature, 100° F.). After it has been immersed for a few seconds, remove and dry. Then perform Sylvester's method of artificial respiration as follows:

After clearing the throat and mouth of mucus place the child on its back on a warm blanket, with the head well back. Raise the arms over the head, then bring them down and press firmly over the ribs. Continue these movements at the rate of fifteen times to a minute for five minutes, then again place the child in the hot bath, and clear its throat from mucus, and feel if its heart is beating. If so, continue the artificial respiration and hot bath alternately, until the child begins to breathe, or until its heart stops beating. When the child starts to breathe it should be placed in the cold bath alternately with the hot until it changes colour. It should then be warmly wrapped up and carefully watched in case it should have a relapse.

(*b*) **Blue Asphyxia.**—Do not cut the cord until it has stopped pulsating, so that the child will get as much oxygen as possible from the mother. Whilst waiting for the cord to cease pulsating, clear the mucus from the throat, slap the buttocks, rub brandy over the chest and tongue, which nearly always bring the infant round. Should this treatment fail, tie and sever the cord, place the child on a pillow by the fire, and perform artificial respiration as follows: raise the child's arm above its head, then down, rolling the child over from the side towards its face, using gentle pressure. Repeat these movements at the rate of fifteen per minute.

2. **Ophthalmia Neonatorum** is an inflammation of the conjunctiva due to infection. (For treatment and symptoms see p. 633.)

3. **Caput Succedaneum** is a swelling which forms over the presenting part of a newly-born infant. It is caused by pressure on the surrounding parts, so that fluid is squeezed into the part which is over the os, and which is unsupported. It occurs when labour

is protracted. No treatment is necessary, the swelling should not be rubbed.

4. **Cephalhaematoma** is a swelling on the head of a newly-born infant. It is caused by an effusion of blood beneath the periosteum, it shows itself a short time after delivery. The centre of the swelling is soft, and depressed, and is the colour of blood; the margin forms a kind of hard ring, and does not form over a suture.

Management.—The swelling should be protected from pressure, and the child put to lie on the opposite side. If it breaks down, medical advice must be sought.

5. **Umbilical Cord.**—Should the cord become sore and bleed, it should be dusted over with tannin and iodoform powder (equal parts). Late haemorrhage of the cord is a very dangerous condition, and a doctor should be sent for at once. The cord must never be pulled off; it usually drops off between the fifth and eighth days, but if not, it must be left until it does.

6. **Jaundice** (p. 232) in the simple form occurs in newly-born infants, and appears about the third day from birth. The infant is very drowsy. Hot water given between meals is usually sufficient treatment, but if not, an aperient is needed, either castor oil or glycerine.

7. **Sore Breasts** sometimes occur in infants. They must not be rubbed or squeezed, place a pad of wool over each and keep bandaged until well.

8. **Retention of Urine.**—If the infant cannot pass water, see that the urethra is clear, that it is not blocked with vernix caseosa (p. 699). If this is not the cause, place the child in a warm bath and give it a teaspoonful of cold water. If still unsuccessful, apply fomentations (p. 90) over the bladder, and inform the doctor at once. Occlusion of the urethra may be present (p. 612) and is not uncommon and requires attention from the surgeon; it is incumbent on the nurse to discover this condition without delay and report to the surgeon.

9. **Tongue Tie** very rarely happens, but when it does it must be reported to the surgeon.

10. **Anterior Fontanelle.**—The anterior fontanelle should be level with the bones of the head; when it is depressed, it is a sign the child is not thriving; when raised, of brain trouble or convulsions (p. 588).

Other complications which may occur in the newly-born child are: thrush (p. 215); green diarrhoea (p. 597); constipation (p. 596); convulsions (p. 588); snuffles (p. 606); bronchitis (p. 248).

CHAPTER XXIV

PHYSIOTHERAPY

PHYSIOTHERAPY is the use of the forces of nature in the treatment of disease; for example, heat, light, electricity, massage, exercise, air and water, comprising treatment other than surgery, or by the use of pharmaceutical preparations.

X-RAYS, GAMMA RAYS, AND ELECTRO-MAGNETIC WAVES USED IN MEDICINE AND SURGERY

THE SPECTRUM

Light.—When a beam of sunlight passes through a prism all the colours of the rainbow may be seen by holding a white card to catch the rays, all of which have come from the sun at the same speed, viz. 186,000 miles a second. The prism analyses the beam of light into a number of different colours ranging from red to violet, forming a spectrum. Since each colour has travelled through the void between the sun and the earth, it is regarded as a disturbance in the ether which pervades empty space and matter. Each may be regarded as a ripple or wave in the ether, the distance between the ripples comprising a pure colour is constant and is known as the wave-length of the light. The wave-length of red light is longer than that of blue light.

Visible light forms only a small fraction of the complete spectrum of ether vibrations which extends from the very short-wave gamma rays, one thousand-millionth of a centimetre in length, to the very long waves used in wireless telegraphy, which may be as much as over three thousand metres.

Ultra-violet rays, though not visible, occupy the space next to the blue band and are of shorter wave-length. The longer of the waves used in X-rays for diagnostic purposes are shorter than these, whilst the waves used in deep therapy and those of gamma rays of radium are even shorter. On the long wave-length side of the band of visible light are the infra-red rays used in heat treatment, followed by those of diathermy, television, wireless telegraphy, and wireless broadcasting. (Fig. 262.)

Sources of ultra-violet rays, X-rays, etc., used in practice are such that the intensity of radiation from each varies inversely as the square of the distance from them. We have learnt that the radiation of radium is emitted from the substance itself, but all

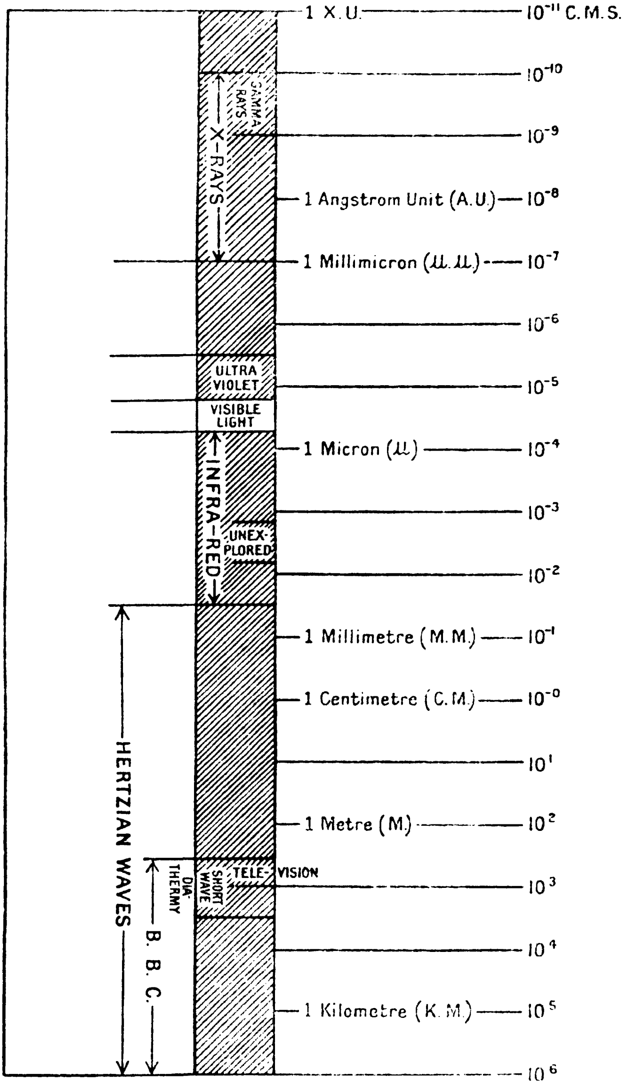


FIG. 262 The spectrum of electro-magnetic waves.

other radiations are emitted by bodies to which some form of energy is applied.

The wave-length of visible light, and radiations of shorter wave-length, are measured in Ångström units, which are one ten-millionth of a millimetre.

X-RAYS

X-rays were discovered in 1895 by Röntgen whilst he was experimenting with the passage of electric current through 'vacuum tubes.' In earlier days experiments had been made by Davy, and later by Faraday, on the phenomena produced when an electrical current is passed between two electrodes inside a sealed glass tube from which most of the air has been removed.

Sir William Crookes, working on the same lines, discovered that by making the cathode electrode concave in shape, the stream of electrons could be focused to impinge on a small area, the centre of curvature of the cathode. Moreover, on striking the walls of the glass tube or a metal disc placed in their path, most of the energy of the cathode stream was converted into heat. Röntgen discovered that this stream of electrons when striking a disc of metal produced new rays which emerged through the walls of the tube, and when they fell on barium platinocyanide or calcium tungstate caused it to light up or fluoresce. This phenomenon is made use of in the fluorescent screen. It is made of barium platinocyanide with a backing of lead glass, and mounted in a wooden frame. When a part of the human body is placed between the X-ray tube and a fluorescent screen, shadows of bones and the denser tissues appear on the screen; the denser tissue giving a proportionally denser shadow. He found that X-rays would pass through many substances, opaque to ordinary light, such as wood, clothing, light metals, flesh, etc., the degrees of penetration varying with the atomic weight or density and thickness of the object. For example, small bones cast a lighter shadow than larger ones, the thin layers of flesh less than the thicker parts, the shadow of the lungs being very much lighter than that of the heart.

Moreover, he found that the rays had an effect on a photographic plate similar to that of ordinary light, and the fact was adapted to medical use. A suitable type of plate was produced, but these have since been replaced by films. When the film is placed on one side of the patient, and the X-ray tube on the other side, an exposure made, and the plate developed, a shadow picture or radiograph of the bones, or of the heart and the lungs, as the case may be, is obtained.

Such substances as bismuth and barium sulphate were found to be relatively opaque to the rays. These substances mixed with milk are given to the patient by mouth when an examination of the alimentary tract is required, the outline of which being soft tissue, and of similar density to other abdominal organs, would not otherwise be defined.

Certain solutions of iodine and bromide were found to produce shadows in the kidneys, gall bladder, spinal cord, bronchi, and sinuses. All these methods have rendered X-rays increasingly valuable for diagnostic purposes.

It was discovered also that X-rays have a biological effect on the skin and tissues through which they pass, and use has been made of this fact for therapeutic purposes.

X-rays have also been found to be of great value for commercial purposes. Flaws in metal or wood can be detected as they are less absorbent of X-rays than sound wood or metal, and use has been made of them, amongst other purposes, in the examination of materials used in the manufacture of battleships and aeroplanes.

PROTECTIVE MEASURES

In the early days of X-rays it was found that after constant work with X-rays ill-health became apparent amongst the workers, the skin of the hands and forearms being damaged, sometimes resulting ultimately in the loss of a limb. In some cases persistent ill-health was caused by the biological action of the X-rays on the blood, and in extreme cases loss of life. This caused great concern, and scientific investigation was made. Methods of protecting the personnel have been developed, whereby the risks to which early workers were exposed have been practically eliminated. Lead, being very dense and comparatively cheap, is generally employed in suitable thickness to give adequate protection against the rays. Lead screens are made, having lead glass windows where required, and aprons and gauntlet gloves of rubber impregnated with lead are used to afford adequate protection. Modern X-ray equipment is so designed and arranged that the rays can be confined to the area where they are required.

An International Protection Committee exists, and the recommendations made by this body cover all the exigencies of the situation, and if adopted ensure the safety of those engaged in X-ray work.

X-ray Tubes and Apparatus.—The earlier type of X-ray tube consisted of a glass bulb with a prolongation at each end, and an electrode was sealed into each end; one, the cathode, concave in shape, and the other, the anode, made of copper with a flat surface at an angle of 35° faced with a harder metal, usually tungsten. The tube was almost entirely evacuated of air, a small amount of inert gas only being left in. When a high potential was applied between the anode and the cathode some of the residual negative ions in the tube, under the action of the high potential between the electrodes, travelled from cathode to anode, on striking which they gave up their energy and produced X-rays. This tube was known as a gas tube (Fig. 263). For the production of the high voltages necessary to generate X-rays in the tube, induction coils were used with interrupters, valves, etc., meters being arranged in the circuit for the checking of measurements of the current and voltage.

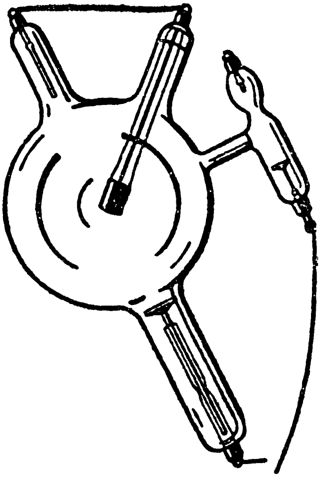


FIG. 263. One of the earliest types of X-ray tubes showing the all-glass construction. Radiation could emanate in all directions as there was no inherent protection either against unwanted radiation or high tension. The protective measures that were adopted for tubes of this pattern were cumbersome mantles of lead or lead glass, considerably limiting the adjustability.

Later on, tubes were designed having a higher vacuum, and a tungsten filament was incorporated in the cathode which when heated showered out electrons, the number of electrons depending upon the temperature of the filament. The temperature of the filament can be varied at will and the current through the tube can thereby be controlled. Ninety-nine per cent of the energy applied to an X-ray tube is dissipated as heat which warms up the target.

In the modern tubes the heat is carried off by means of a water-jacket or a fin radiator, and to protect the staff the tube is covered with an outer casing of lead, the aperture only being free (Plate XLA).

Apparatus has changed to meet the new requirements, transformers taking the place of coils. Methods of control have been improved, time switches and suitable meters are now incorporated in the circuit. Practically all apparatus is now shock-proof (Plate XLB).

Some X-ray units can nowadays produce anything up to 1,000,000 volts, and apparatus of this type is used in deep X-ray therapy producing X-rays which have a penetrating power approaching that of gamma rays.

X-ray Films.—The X-ray plates first used were of glass, covered on one side with photographic emulsion and wrapped in black paper, sealed in a light-tight envelope. They were made in a number of different sizes to suit the requirements of particular cases. Later, films were utilized, these being gradually improved in quality and also in safety. A non-inflammable film can now be obtained. The speed was increased by coating both sides of the base with emulsion, and by the use of *intensifying screens*. These consist of a pair of screens made of thin cardboard with a coating of calcium tungstate on their inner surfaces. These screens are very fragile, and must be handled with great care. The film is placed between them. The calcium tungstate absorbs part of the X-ray energy and converts it into light, which acts on the film in addition to the X-ray effect and reduces the exposure time required. The film, with screens, is used in a cassette which is made of a light metal. It has an even pad on the back to exert a uniform pressure, and a spring fastener to keep it firmly closed and free from light.

The Potter Bucky Diaphragm.—When X-rays pass through the body, some of them are deflected from their straight passage and become scattered in all directions, producing secondary rays. When a film is required of the thicker, denser parts of the body, these secondary rays produce a blurred effect. To reduce this effect a Potter Bucky diaphragm is used. This consists of a grid composed of alternate strips of thin wood and lead, which is placed between the patient and the film. A special mechanism gives the grid a uniform motion at right angles to the beam and to the direction of the strips during the X-ray exposure. The grid reduces the amount of scattered radiation reaching the film, while the motion ensures that the lead strips shall not cast unwanted shadows. The exposure time needs to be increased, but the result is a clearer negative. It is particularly of value in the X-ray of the thicker parts and of obese patients.

Portable Units.—These are designed for ward use. They are invaluable for taking X-ray films of fractures that are put up in extension splints, and of patients who are too ill to be taken to the X-ray room. A unit for transport can be obtained which can be run from the engine of a motor car, being particularly useful in country districts where the voltage of electrical supplies may be different, or where there is no electrical supply (Plate XLc).

Dental units are designed for the special purpose of dentistry, the generator and X-ray tube being enclosed in a small case, with an easy centring attachment, and so constructed as to be easily manipulated.

DIAGNOSTIC X-RAYS

In a diagnostic X-ray department, a technique or method of investigation is established for all X-ray examinations that are likely to be required. These are arranged and approved by the radiologist who directs the department, which is staffed with radiographers, nurses, and technicians. The methods of production and technique used must necessarily vary in different hospitals, but the basis on which they are founded remains the same.

All films should be marked plainly with a lead number, and also R. (right) or L. (left).

All films and numbers should be entered in a record book against the patient's full name, with particulars of exposure and any relevant details.

After exposure the films are developed, dried, diagnosed, indexed, and filed in such a way that they are easily accessible when required. Examinations that require long preparation or preliminary ward treatment should be specially arranged in order to give no unnecessary inconvenience to the patient.

A brief description of the more common uses and methods of diagnostic X-ray work is given below, and illustration of various radiographs appear in Plates XLI, XLII, and XLIII.

Bones.—A radiograph can be taken of any part of the bony skeleton. The patient is placed on a flat wooden-topped couch (Plate XLIVA), the limb or part for examination placed in the required position, supported, if necessary, by pads or sand-bags to prevent movement. A film is placed below, the tube centred above, and the exposure is made. Usually views in two or more planes are required. Splints are not moved unless specially indicated. Most splint materials, including plaster of paris, can be penetrated by X-rays. An image of the shadow of the bony parts is shown on the film when developed, and fractures, dislocations, bony changes, and diseases can be diagnosed from them.

Heart and Lungs.—The patient is practically always placed in the vertical position in a screening stand with the fluorescent screen in front and the tube behind him (Plate XLIVB). A screen exposure is made to adjust the position, the film is put in place behind the fluorescent screen, the tube is run back to a distance of six feet, which increases the sharpness of definition, and the exposure is made. This is sometimes known as teleradiography.

The Kymograph is a special piece of apparatus fitted to the screening stand consisting of a moving sheet of lead, with horizontal slits in it through which X-ray exposures are made on a film. A timing device is incorporated, and the resulting radiograph gives a cinematograph effect on the contour of the X-ray shadows, not shown in the usual technique. This gives information of great value in the detailed examination of the heart, alimentary canal, etc.

The Orthodiascope is a special piece of apparatus attached to an

X-ray screening stand, with a chart superimposed on which can be traced the outline of the patient's heart in one or more planes.

The Tomograph and Planigraph are special attachments fitted to a screening stand or couch by means of which an X-ray film can be taken at any given depth, sharply defining the image at the particular part required whilst leaving only a blurred effect of the surrounding parts, thus eliminating the effect of the superimposed shadows. It is used in chest radiography, and also in the examination of other organs.

Opaque Meals.—These are given for the examination of the alimentary tract. The patient is prepared by giving an aperient for the two nights before the examination, light diet the day before, and only small quantities of 'thin drinks' containing no milk or food-forming substances during the twelve hours preceding the meal. An enema should not be given as a part of the preparation unless specially indicated.

The meal.—There are many prepared opaque meals on the market, but the basis of them is either barium sulphate, or bismuth carbonate. Barium sulphate will be quoted here:

Six ounces of barium sulphate are mixed in 1 pint of milk, stirred continuously, making a smooth paste. This is taken by the patient, a further small quantity being mixed to be taken whilst the oesophagus is being examined. The patient is screened at the time of the meal, six hours, and twenty-four hours after, when it will be seen in the stomach, ileo-caecal region, and large intestine respectively. Additional examinations are made to suit the particular case. Films can be taken at any or all of the examinations, as required. It is sometimes required to produce a 'relief' picture of the lining of the stomach wall, when a thicker paste is necessary, 4 ounces barium sulphate to 4 ounces of milk. A bolus is sometimes used in examination of the oesophagus. It is made of barium sulphate suspended in gelatine and glycerine, and has the consistency of a soft solid. It is taken like a pill, and is demonstrated in a stricture of the oesophagus, showing its position.

Opaque Enema.—The preparation is the same as for the meal, with the addition of a rectal wash-out. Two pints of the barium sulphate mixture—at a temperature of 100° F.—are given slowly per rectum with a glass funnel and a rectal tube. A screen examination is made and may be repeated in twelve or twenty-four hours.

In both opaque meals and opaque enemata no aperient, simple enema, or rectal wash-out should be given until the X-ray examination is completed.

Examinations of the Genito-Urinary Tract.—The patient is prepared by giving an aperient on the two nights preceding the examination.

Charcoal 30 grains, usually made up in 5-grain tablets, may be given to reduce flatulence. Light diet the day preceding the examination. A straight X-ray film may be all that is required, and will serve to show if a calculus is present. If a pyelography is necessary, the patient must have only sips of fluid for at least twelve hours before the examination, and no solid food.

Intravenous Pyelography.—A preliminary straight film of the renal, ureter, and bladder regions is taken. Urosolectan B, which is a proprietary preparation containing pyridoxyl, a substance opaque to X-rays, put up in a sterule containing 20 c.c. is injected into a vein, in the front of the elbow. An X-ray exposure is made, followed again in ten minutes and thirty minutes, and one hour if required. The patient should remain undisturbed in a recumbent position, the foot of the couch raised and a pad fixed over the bladder region (to hold up the dye in the pelves of the kidneys) between each exposure.

Retrograde pyelography.—An operating cystoscope is passed into the bladder, and a bladder wash-out made with normal boracic lotion until the return flow is clear, and then filled again with about 200 c.c. of the lotion. The ureteric catheters are passed through the cystoscope into the pelves of the kidneys, 10 c.c. of the solution of sodium iodide 10 to 25 per cent is passed into each ureteric catheter, and the X-ray exposure of the whole tract is made immediately. When the examination is completed, the contents of the bladder are emptied, and the cystoscope with catheters withdrawn.

Examination of the Gall Bladder.—The preparation of the patient is similar to that for the examination of the genito-urinary tract, in addition to which no fat-containing foods must be taken. A straight X-ray only may be required, but it is frequently supplemented with a cholecystography, which may be intravenous or oral, usually the latter.

Intravenous.—An intravenous injection of tetraiodophenolphthalein up to 45 grammes is given, half of the quantity into a vein in each arm, at midnight, only sips of water being taken after this. An X-ray film is taken at 8 a.m., another at 10 a.m. A fat-containing meal is now given, an ideal meal being lightly cooked egg, thin bread and butter, and a glass of milk. At 12 noon a third X-ray film is taken. Subsequent films may be necessary to suit the individual case.

Oral.—Several proprietary preparations are on the market for the purpose. Opacol will be quoted here. Opacol is a preparation of sodium tetraiodophenolphthalein. The patient is prepared as before, a meal entirely free from fats is given at 5 p.m. The whole of the contents of a sealed bottle of opacol is given in half a tumbler of water, the mixture having been stirred continuously until it is white, at 6 p.m. The dose should be sipped slowly and followed by a further drink of water to remove the taste. No other food or drink must now be given, except the merest sips of water, until 9 a.m., when the first X-ray film is taken, followed again at 11 a.m. by the second film. A fat-containing meal is now given and a third film taken at 1 p.m.

Myelography.—An examination of the spinal canal can be made. No special preparation of the patient is required. The hair should be shaved from the back of the neck, and the skin surgically cleaned. A local anaesthetic, solution novocaine 2 per cent, is given into the surrounding tissue. The patient should be in a sitting position with the head slightly flexed forward. A lumbar-puncture needle is passed through the theca above the first cervical vertebra, and about 5 c.c. of cerebrospinal fluid withdrawn. Lipiodol—which is a proprietary preparation consisting of 40 per cent iodine and poppy seed oil—is used; 5 c.c. or less is injected through the lumbar-puncture needle with a Record syringe. X-ray exposures are made in both vertical and horizontal positions of the whole spinal canal. If any obstruction or abnormality is present it will be demonstrated in the film, and subsequent films of that region may be required.

Bronchography.—A local anaesthetic is required, the throat being sprayed with solution of cocaine, 4 per cent. The patient is placed in a semi-recumbent position, turning slightly to the side on which the examination is being made. A rubber catheter or special syringe nozzle is passed through the mouth into the larynx, and 5 c.c. of lipiodol, or neo-hydrid, a somewhat heavier medium, is injected into it. This will be inhaled into the bronchus—the patient is cautioned not to cough—and is now put in position for an X-ray of the chest, and the films are taken, if necessary in several planes. No food or drink must be given to the patient until the effect of the local anaesthetic has passed off.

Sinuses.—It may sometimes be required to show the direction of the tract of a discharging sinus in the tissue. A fine rubber catheter is passed into the sinus as far as possible without discomfort to the patient, and 5 to 10 c.c. of lipiodol injected into it, and X-ray films taken in two or more planes.

Ventriculography.—The patient is given a general anaesthetic, and air is introduced into the lateral ventricle of the brain through a burr hole in the skull, under aseptic conditions. X-ray films are taken in several planes.

Encephalography.—Air is injected into the spinal theca, the patient being in the erect or semi-erect position, allowing the air to rise to the skull. X-ray films are taken in several planes. This examination produces a very severe reaction on the patient.

Arteriography.—Thorotrast, a proprietary preparation consisting of a colloidal suspension of dioxide of thorium, is injected into the blood stream and views of the skull are taken.

X-RAY THERAPY

X-ray therapy is the term employed when use is made of the biological effects of X-rays. The apparatus for this must be capable of working at a very high voltage, producing very penetrating X-rays; units in general use give 200,000 volts, and there are an increasing number of units giving much higher voltage, going up to 1,000,000 volts (Plate XLVA). Constant-tension generators provided with delicate controls for adjusting the X-ray output of the tube are generally employed nowadays. The X-ray output is measured with a dosimeter, and the conditions are such that a dose can be calculated, and controlled, and repeated exactly, as often as required. The X-ray tubes are longer than those used in radiography, and are built to withstand very high voltage. Moreover, they are provided with special water- or oil-cooling systems to dissipate the heat generated at the anode. The lead protection around it needs to be increased as the radiation produced is much more penetrating than that used in radiography, and the high-tension leads are so designed that there is no danger to the patient from electric shock.

Superficial therapy is used at a comparatively low kilovoltage, giving a minimum wave-length of the order of 0·1 to 0·2 Ångström. Deep therapy at 200 kv. corresponding to a minimum wave-length of about 0·06 Ångström.

The X-ray beams used in X-ray therapy are always filtered, the metal used being aluminium, copper, tin, or lead, the metal and thickness varying with the kilovoltage, the idea being to remove the less penetrating, unwanted X-rays from the beams.

Applicators are made of various lengths and sizes of aperture, and are used to meet the particular needs of the case, being made with a standard fitting to attach to the X-ray tube—the sides of the applicators are of lead protective material, the beam of X-rays being delivered only through the aperture at the end.

The measurements of the doses to be given are made under very exact conditions—kilovoltage, milliamperage, distance, size of field, filter, and time, are the chief factors that enter into it. A dosimeter is used for calibration. This consists of a small ionization chamber connected to a sensitive meter, the indications of which can be calibrated in terms of the international röntgen, the unit of X-ray intensity.

The röntgen (r) is an ionization measure of radiation, and is that quantity of radiation which, when the secondary electrons are fully utilized, and the wall effect of the chamber is avoided, produces in 1 c.c. of atmospheric air at normal temperature and pressure such a degree of conductivity that one electrostatic unit of charge is measured at saturation current. This is the unit 'dose' in X-ray and radium therapy.

All treatment is ordered by the radiologist, and an exact detailed record is kept of each treatment. The main principle in deep therapy is to deliver as large a dose as is practicable to the growth without unduly damaging the skin around it. This is effected by using as many ports of entry for the beams of X-rays as possible, all focused on to the lesion which receives the maximum effect of the crossed beams. The patient should receive the total dose in a given time, to receive the greatest benefit. If the time be increased, the dose must be increased to produce the same effect.

The patient is placed on a couch or in a suitable reclining chair, in as comfortable a position as possible, as he must keep perfectly still throughout the treatment. The tube is set in position to treat the particular area, the size of the applicator and the filter having been checked, and the treatment commenced.

The operator works in a lead-protected control cabin, from which there is an uninterrupted view of the patient, and where certain meters and controls are under constant observation.

Certain skin diseases, psoriasis, acne, ringworm, sycosis barbae, also keloid, corns and warts are often treated successfully with X-rays.

In many cases X-rays have superseded surgery. Malignant growths can be completely reduced, and glandular involvement arrested. Even when metastases have occurred at a later stage, that also can be treated, and improved, growths of tongue, mouth, air passages, sinuses, lungs, breast, uterus, bladder, rectum, bone tumours are amongst those which are frequently treated this way. Hodgkin's disease responds rapidly to comparatively small doses.

GENERAL AND LOCAL NURSING TREATMENT OF PATIENTS

General.—Some of the conditions require only a few treatments, and the patient is unlikely to have any subsequent discomfort, but when a widespread or deep-seated growth is present, many treatments lasting over a period of three or four weeks are likely to be necessary. This is something of a tax on the patient, therefore the general condition needs to be carefully watched. A blood count is made at the outset and at intervals during the treatment if necessary. Warmth, good nourishing food with extra sugar, a cheerful and encouraging atmosphere are all essential, and the patient should be encouraged to be up and about for part of each day. Iron is given in large doses.

The skin of the treated parts should be protected from rubbing by clothing or adjacent parts. After a few treatments the skin becomes reddened. This is known as a reaction. It goes on to a desquamation, and this is known as a 'chute.' The skin may become broken. A simple vaseline dressing is used, but for the reaction of an ulcerated growth a dressing of solution of brilliant green, 1 in 1,000, or solution of gentian violet 2 per cent is used.

Local Nursing Points.—Tongue, Floor of Mouth, Larynx, etc.—Teeth are extracted before treatment commences. Frequent mouth-washes, and if necessary syringing. *Diet:* Fluids and semi-solids, nasal and rectal feeds being resorted to if necessary. A food chart should be kept. The skin of the irradiated area should be protected from rubbing by clothing.

Oesophagus.—As above. In extreme cases, when there is a complete stricture, a gastrostomy may be performed.

Breast.—When the breast is of the very heavy type it should be supported by a sling or special bandage. Ulcerated areas or skin reactions should be dressed with vaseline, brilliant green, or gentian violet, and dressed in such a way as to keep the parts from rubbing each other, particular attention being paid to the axilla, and the bandage being one that is easily applied. The garments should be of a type that is easily removed without a lot of stretching on the patient's part. The ulcerative type of growth may slough, taking a long time to heal. A surgical diathermy excision may be performed, and a skin graft in the later stages.

Uterus and its Adherent Parts.—Urine tested, and measured if any shortage is noticed, bowels kept open freely. Vaginal douches given, simple vaseline dressings, with special attention to the groins.

Rectum.—The bowels must be kept open freely, urine tested, and measured if necessary. Avoid rubbing of clothing, and apply simple vaseline dressings, giving special attention to groins, and folds of the buttocks. A colostomy may be necessary, either permanently or as a temporary measure.

Bladder, Prostate, and Male Genitals.—As for rectum. In addition, bladder wash-outs if required, and a urinary disinfectant given. A supra-pubic cystotomy may be performed, or a permanent catheter put in place. In all lower abdominal treatments it is preferable to have the bladder emptied when the front areas are being treated, and the bladder should be left filled during the treatment of the back areas

Limbs.—The limb must be kept at rest in a sling or suitable suspension splint. If there is an ulcerated area, the dressing should be so arranged that the limb is disturbed as little as possible, for this and general nursing purposes.

RADIUM

Radium is an element found in very small quantities in pitchblende. Its radioactive property was discovered by Madame Curie in 1897, whilst she and her husband Pierre Curie were experimenting with pitchblende. This pitchblende was obtained from mines in Bohemia. For a long time this remained the only source of supply; work on mines in Colorado and Utah, U.S.A., was organized about 1920, and they were producing at this time the greater part of the world's supply. In 1921 mines rich in radium which had been discovered in the Belgian Congo were industrially organized, and with the larger supply of radium available, the more general facilities of distribution, and the reduced cost, it became more readily obtainable for medical uses in all countries. In 1932 radium mines were started in Canada, which now yield a very considerable quota of the world supply. This again reduced the price of radium, but the process of extracting a very small quantity of radium from a very large amount of pitchblende is intricate and lengthy, and the total amount in use is still comparatively small.

The radiations of radium used for clinical purposes are produced by a series of atomic changes that take place while the element radium is breaking down into lead. Radium salts, either sulphate, bromide, or chloride are used and packed into sealed containers. The containers or cases are made of platinum, silver, monel metal, and occasionally glass. The thickness of the walls varies from about 0·5 mm. to 0·6 mm. when made of platinum, though for special purposes thicker containers are used. The shape and capacity of the container and amount of radium vary according to the special purpose for which it is required. The cap or lid of the container is screwed on, and electrically welded with gold. The reason for this is that one of the intermediate products in the breaking down of radium is gaseous, and if the seal of the container is not intact some of the gas will escape and be lost, and it might give rise to radioactive contamination.

Alpha Rays consist of swiftly moving nuclei of helium atoms which have very little penetrating power, and are so readily absorbed that a piece of notepaper will stop most of them. These rays are not used clinically except in spa treatments when radioactive water is administered.

Beta Rays consist of high-speed electrons having more penetrating power than alpha rays, but which are reduced to inconsiderable proportions by the wall of most containers in clinical use. A special container is used when the beta rays are to be utilized.

Gamma Rays consist of electro-magnetic vibrations of the same kind as X-rays, but of a much shorter wave-length, and it is these gamma rays, owing to their high power of penetration, that are mostly used for clinical purposes.

METHODS COMMONLY USED IN TREATMENT

1. **Bomb, or Beam Therapy.**—In this method 1 gramme or more of radium is used, contained in a lead or tungsten alloy casing with an aperture through which the rays pass, the skin surface being at a distance of 3 to 8 cm. from the radium. The radium container is mounted on a specially constructed stand provided with many degrees of freedom of movement, enabling the operator to direct the beam to any particular area with ease. To apply the requisite dose to the lesion, which is often deep-seated, the radium beam is generally applied in turn to a number of different areas of the skin.

2. **Surface Applications.**—(*a*) A small bomb consisting of a substantial quantity of radium (0·5 to 1 gramme) is arranged on a special holder at a distance of 3 cm. or less, which can be used in turn for many patients. These holders may be in the form of collars or other shaped appliances. They may be of wood, or papier mâché of sufficient strength to be used many times.

(*b*) Applicators of wax and synthetic resin are often made to fit a particular part of a patient. The radium units are mounted on them so as to produce an even irradiation of the surface. Substances useful for this are Columbia paste, sorbo rubber, felt, corrugated cardboard, Nidrose, and Stent's dental composition.

Columbia paste is a mixture of beeswax, paraffin wax, and sawdust. It has the advantage that while quite hard at blood heat, it is easily moulded at a temperature of 114° F. It is made up in slabs of 0·5 cm. or 1 cm. thick. A piece of the approximate size required is cut off, softened in hot water, moulded to the required shape on the patient, and placed in cold water at once to keep its shape This can be built up to the required distance between the skin and the radium with a cardboard box of the required shape, and the underlying paste cut away to avoid pressure on the patient's skin. The area on which the radium is to be placed is marked out in indelible pencil, and adhesive strapping fastened on. The radium is placed on this, covered in with another piece of strapping, and the edges bound firmly; melted wax is run over to seal it so that the radium is safely enclosed. The Columbia paste after use on unbroken skin can be melted down, poured into moulds, and fresh slabs made. (Plates XLVIA and B, XLVII.)

Sorbo rubber, felt, and corrugated cardboard have the advantage of being very light. The distance with each of these materials can be increased with small blocks of wood, corks, or the lid of a cardboard box, stuck on to the outer layer, the aim being to keep the finished applicator as light in weight as possible.

Nidrose is a proprietary material. Heated on an electrical hotplate it becomes softened, and is readily moulded to the required shape on a plaster cast of the part to be treated. It quickly hardens again. The distance can be built up as with the previous materials.

Stent is convenient for applicators for odd-shaped surfaces; the material is pliable when placed in boiling water and kneaded into a soft mass. It takes the shape of the surface on to which it is pressed and quickly hardens. Holes are drilled in it for housing threaded radium needles, and a little wax dropped into each end of the holes will keep the needle in place.

(*c*) *Flat metal applicators* containing radium screened only by thin monel metal or silver, giving beta as well as the gamma rays, are made for surface irradiation in direct contact. These are made in 5, 10, or 20 mgm. units, with an area of 1 to 4 sq. cm.

3. **Intra-cavitary Applicators.**—(*a*) *Intra-vaginal or intra-uterine.*—The radium in the form of 5 mgm. tubes is packed into silver boxes. Two of these containing 40 mgm. each are put into the fornices of the vagina. Two tubes each of 20 mgm. are packed into a silver tube, slightly bent at the centre, and placed in the cervix. The applicators are prepared for use by putting each into a rubber bag made to fit, tied firmly with strong thread, and sterilized for five minutes. They remain in position for the specified time (Plate XLVIA).

In some cases when there is great deformity due to ulceration, these applicators cannot be used, and a special one is made of Stent or wax, the radium being placed in or on these.

(*b*) *Intra-rectal.*—A Tod's applicator is used (Plate XLVID). This consists of an inner tube, formed by a rectal catheter and an outer air-containing rubber tube over it, which starts 3·5 cm. from the tip and extends 15 cm. along its axis. A hard block of rubber, held in place by a rubber ring, comes below this to keep the applicator in position. From 30 to 40 mgm. of radium are used, the tubes being threaded with strong thread and inserted in the inner tube. The position of the needles is then checked by an X-ray examination, and they are kept in place by sewing the thread at each end to the rubber tube.

(*c*) *Intra-oesophageal.*—A silver tube 10 cm. long and 1 cm. in diameter is used. It has a central canal of 4 mm. and is surrounded by six small holes to take the radium needles. The radium needles are ' staggered ' to prevent an uneven irradiation, i.e. so arranged that the inactive portions of the needles, the eye and the points, are not in a continuous band in the applicator. This silver tube when loaded is placed inside an adapted Symonds's feeding-tube, threaded with strong silk, which comes through the mouth and fastens to the side of the face. The applicator is passed into the oesophagus by means of a Symonds's introducer (Plate XLVIc (*b*), (*c*), (*d*)).

(*d*) *Dental plates.*—These can be adapted for growths of the palate, tonsil, and floor of mouth. They are made for the individual patient in the form of a denture with the addition of a little box in which the radium is packed, and kept in position with dental wax. The needles are always threaded, the ends being knotted together, and kept outside the mouth. A screen of lead is used when necessary to protect the surrounding unaffected parts from irradiation. The dentures are kept for further use if required (Plate XLVIIA).

4. **Interstitial—by Buried Needles.**—The needles are threaded with two threads, tied separately, and immersed in methylated spirit twenty-four hours before use.

They are distributed in the tumour to produce as uniform a radiation as possible, radium-holding forceps being used to introduce the needle, and a pusher used to press it into place. When a tumour of the tongue or the mouth is being treated, gags are required, and the tongue is brought forward by means of a strand of silkworm gut sewn through it and held by an artery forceps. The threads are knotted together, and kept outside the mouth to make them easier to check. In external tumours the threads can be tied together from opposite sides, so helping to anchor the needles, the whole being well covered with flavine, and sterile dressing, and kept in place with Elastoplast bandage. The dressing is not generally removed until the needles are taken out.

Dosage.—The international röntgen (r) which is the unit of ' dose ' in X-ray therapy is employed in the measurement of radium dosage.

The intensity of gamma rays is usually measured by an ionization method, and the ' dose ' so measured is expressed in terms of the international unit of ' dose,' the röntgen. Another unit of dosage is the Sievert unit ' dose ' which is the amount of gamma radiation received in one hour at 1 cm. from a point source of 1 mgm. of radium filtered by 0·5 mm. of platinum. It is generally accepted that the Sievert unit dose is of the order of 8 röntgens per hour. By using this relationship it is possible to express gamma ray ' doses ' in röntgens. Measurements of radium applicators may be made with Sievert condensers; these are spherical in shape, usually 1 cm. in diameter. They are electrically charged, and placed on the skin surface of the applicator. Under the action of the radium rays the charge on the condenser is dissipated, and the loss of charge occurring in a given time can be measured by suitable electrometers. It is possible to translate the rate of loss of charge from the condenser into röntgens per hour. From measurements of this kind the time required to deliver a given dose, usually 6,000 r., to a lesion placed in contact with the applicator may be calculated.

Dosage in radium therapy is sometimes calculated, stated, and recorded in ' milligram hours.' That is the total amount of radium used, multiplied by the time in hours for which it is applied.

' Millicuries destroyed ' (mc.d.) is another system sometimes employed. These units can be converted into mgm. hours by multiplying mc.d. by 133.

In all cases every detail of dosage should be recorded, and a card with the essential headings is useful for the purpose.

Safety and Care of Radium.—*Safety in department.*—Many types of safe are made for housing radium when not in use. Drawers of varying sizes are made for the different needles and containers, and these slide into lead blocks, the whole again being surrounded by lead of a suitable thickness. For 0·5 gramme of radium 10 cm. of lead on all sides is necessary, and for 1 gramme 11·5 cm. of lead on all sides is necessary. These thicknesses of lead prove adequate to protect those who are responsible for the custody of the radium. Another type of safe is made in the form of a lead box with a cavity in front, which has a corresponding block of lead on the door to fit the cavity. This is useful for storing radium when it is undergoing test for leakage, or for applicators which cannot be housed in the drawers usually made for radium.

When an applicator is made, the number and strength of the needles should be checked by another responsible person before being safely closed in. Needles prepared for interstitial use are threaded with two threads, tied in a double knot; the needles are checked, and then placed in a carrier consisting of a slab of lead fastened to one end of a metal plate, the other end having a strip of rubber with grooves, over which the threads can be drawn. These plates can be put in methylated spirit in a metal container with a lid and a strap for carrying (Plate XLVIIB).

The whole of the radium in the safe should be checked frequently by two responsible people, and balanced against that booked out in the wards. The amount and description of the radium used for each patient are booked on each patient's radium card, and also in a record book, when issued. As a precaution against the loss of radium containers, all the dust from table and floors in the radium room is put into a bin, as are also threads, dressings, and remnants from applicators when dismantled. The bin is not emptied until it has been tested for radium by the physicist.

Safety in wards.—A red label marked ' Radium ' should be tied to the bed of each patient undergoing treatment. All radium when it is given out is entered on the ward case-paper and in a small note-book. A diagram, with a description of the needles and time for which they are to be worn, is given. The radium is signed for by the sister in charge, and again when it passes from her duty time, and so on. In cases where an applicator is being worn, but not continuously, a padlocked lead-lined box is kept in the ward, in which the applicator can be placed when not in use. The hours for which the applicator is worn each day are recorded. Patients undergoing treatment of the mouth, tongue, or tonsils by the interstitial method usually need the continuous care of a special nurse who is working under the sister's supervision. Patients wearing radium who are not in bed all day must stay in one place, and not be allowed to leave the ward. All dressings are put in a separate container, and bed linen in a separate bag, which are kept until they have been tested electroscopically for radium before disposal.

Care of radium.—Lead containers or boxes with strap handles are used for carrying radium from place to place. Special grooved forceps are used to prevent the surface of radium needles being scratched (Plate XLVIC (*e*)). When returned from əsn the needles are put in lotio carbolic, 1–20, and cleaned with a piece of wool on forceps, rinsed in ether, drained, and put in the safe. A needle may be bent when being pushed into tissue; it can usually be straightened very gently, but should always be tested electroscopically for leakage before going back into use.

Protection for workers.—It is important to keep as far away from radium as conditions will allow, as distance provides the greatest factor of safety. For this reason radium manipulations are carried out with long-handled forceps. Further protection must also be provided for radium workers in the form of lead-topped tables, with front and side screens of lead. Lead screens and blocks of lead can be adapted to any special requirement. Experience has shown that by the use of protective measures the amount of radiation received by the staff may be so small as to be tolerated with safety, provided these protective measures conform to the International Recommendations for X-ray and Radium Protection. The so-called tolerance dose corresponds to a radiation intensity of 0·2 r. per working day. Workers with radium or X-rays should from time to time carry on their persons a detector which measures the amount of scattered radiation to which they are exposed during their work. These detectors can take the form of either Sievert condensers, or dental films, the blackening of which by gamma rays is known, and may be estimated in terms of the daily tolerance dose.

Radon.—In hospitals using radon a considerable amount of radium element, generally not less than 0·5 grammes, is kept in solution, and apparatus is provided by means of which radon, which is a gas, may be collected and passed into fine glass tubes which are then sealed.

These tubes are put into containers for use. The intensity of the radiation of each tube is measured and compared with that of radium, one millicurie of radon having at the outset a gamma ray intensity equal to that of 1 mgm. of radium. The activity of the radon gradually falls—its value at the end of four days being reduced to one-half, and at the end of fifteen to thirty days to practically zero.

ULTRA-VIOLET LIGHT

Luminous rays are primarily derived from the sun, and the stars. The light of the sun has been recognized from the earliest records of man as having health-giving properties, and history shows us that all down the ages use was made of the sun's rays for the treatment of disease and to help to maintain good bodily health. Referring to the spectrum (Fig. 262), it will be remembered that visible light occupies only a small part of the whole spectrum of electro-magnetic vibrations. Sunlight contains rich ultra-violet rays which occupy a small band immediately beyond the violet end of the spectrum, but these are mostly absorbed in the atmosphere, and still more rays are cut off on account of the pall of smoke and dust which overhangs large towns and cities. At the other end of the spectrum of visible light beyond the red visible rays come the infra-red rays. These are the heat rays.

Much use is made of artificially produced ultra-violet and infra-red rays for therapeutic treatment.

In parts of Switzerland treatment is carried out by natural sunlight, known as helio-therapy, with the most beneficial results. In this country, however, with its changeable climate this is not generally practicable, though there are several clinics where helio-therapy is carried out with great success.

Ultra-violet rays are radiated from electric arcs. Finsen was the pioneer in the use of the open arc lamp for healing purposes. This type of lamp consists of two carbons impregnated with chemicals, or with a tungsten iron core.

Another type of ultra-violet burner is the mercury vapour lamp. This closed arc lamp consists of two electrodes sealed into a quartz tube in an atmosphere of mercury vapour. The reason for using quartz is that it is transparent to ultra-violet rays, whereas ordinary glass transmits very little ultra-violet light. Special glasses are made which let through a considerably greater amount of natural ultra-violet light than ordinary glass.

The effect of ultra-violet radiation on the body is of great benefit in many diseases, and is also of great value in convalescence, nutritional disorders, due to deficiency of vitamins in the diet, particularly in rickets, tuberculosis (other than pulmonary), certain skin diseases, particularly lupus, septic wounds, boils, varicose ulcers, etc.

The tolerance of the skin to ultra-violet light varies with the individual, and in applying the treatment a test is first made of the reaction of a small portion of the patient's skin to ultra-violet light, using the same lamp and the same conditions, viz. size of arc, amperage, skin, arc distance for each patient. The patient is then graded. The first effect produced by the rays is an erythema of the skin, which appears four hours or so after treatment. After repeated exposures, the skin gradually becomes brown. A severe erythema must be avoided, as the effects are identical with those of burns. It is advisable for this reason and also on account of the possibility of the danger of electric shock from the lamp, that all treatments should be given under the supervision of a trained operator.

The lamps most commonly used are:

(1) Open arc, carbon or tungsten core for general or local treatment.
(2) Kromayer enclosed arc for general or local treatment.
(3) Quartz mercury vapour for general or local treatment.

The open arc produces radiation like that of natural sunshine, and also gives a pleasant heat. The mercury vapour lamp gives practically no heat. The open arc type may be arranged as a separate lamp, a pair of lamps in series, or in a separate lamp with four pairs of carbons in parallel. The open arc is useful in a large clinic when several patients can be placed around it at the correct distance, and treated together.

The lamps for local treatment are enclosed in a case, with a quartz window to allow the emission of the rays. They may be used directly to the area required, or, when the area is very small, an adapter and a quartz rod can be fitted through which the rays will pass.

Small hand-lamps are made for use in the home; these should be used with great caution.

Wood's glass, a specially made glass, transmits only invisible ultra-violet rays. When it is fitted to a mercury vapour local lamp, and the room darkened to cut off all extraneous light, a beam of ultra-violet ray is produced, which if allowed to fall on certain substances such as vaseline or eosin causes them to fluoresce brilliantly.

This phenomenon is also applied to many industrial uses. Some impurities in dyes are immediately discernible, and one of the uses made of ultra-violet ray is in the detection of forgeries. Paints, varnish, india-rubber, textiles, etc., can be tested by this means to confirm their purity, age, or durability, etc.

Food that has been irradiated by ultra-violet rays becomes much stronger in vitamins, and through this process the synthetic production Vitamin D was established.

RADIANT HEAT

Radiant Heat is produced by means of an electric current passing through certain lamps or open filaments, producing heat waves with wave-lengths mainly in the infra-red region.

Radiant heat bath—this is arranged as a bed or in the form of a box, with a number of tungsten filament bulbs placed around it, the whole being covered in with an asbestos-lined rug or cover. Smaller units on similar lines are used for limbs, and a hand lamp for local use is sometimes convenient. It is the heat that is utilized in this form of treatment, and it is very extensively used in the treatment of osteoarthritis, fibrositis, and the after-effects of injuries, and many other conditions.

Infra-red Treatment is also a form of radiant heat treatment. An element consisting of an open filament of nickel chromium wire is mounted in a stand. These have a more penetrating effect than the lamps, and are largely superseding them.

DIATHERMY

This is also a method of using heat for clinical purposes, but the heat is created in the patient by a high-frequency electric current generated by an apparatus which converts a current that is alternating fifty times a second into one that alternates not less than thirty thousand times a second, and often several million times a second. There are two forms of apparatus, one in which a spark gap causes electric oscillations, and one in which a valve similar to that employed in wireless telegraphy is used.

Long-wave Diathermy.—A wave-length of about 100 to 300 metres is employed for surgical operations, and for the treatment of localized lesions, to produce local heat.

It is used increasingly in surgery, it being possible to adapt the machine for surgical purposes, special point- or knife-cutting electrodes being fitted. It is used largely for local excisions. A special cystoscope is made use of, insulated with bakelite, having an electrode at its tip, by which means papillomata of the bladder can be treated.

Two cables convey the current from the machine, and these attached to electrodes of suitable size, varying with the part that is being treated, are placed in position, the patient forming part of the circuit. It is used quite extensively in the treatment of injuries, inflammatory conditions, diseases of the joints, nerves, fibrositis, and also in certain cases of gonococcal infection.

Ultra-short-wave Diathermy machines producing radiations having a wave-length of 6–30 metres are sometimes used for treatment. The whole or a large part of the area that is being treated by this means is raised to the temperature desired, often 108° to 112° F., and maintained at this temperature for a given time, generally half an hour or more.

All forms of diathermy are liable to cause serious interference with broadcasting receptions for a considerable distance around the apparatus.

FARADIC AND GALVANIC ELECTRICAL TREATMENT

Electromotive Force.—This term is used in electrical science as a measure of the pressure of electricity; it is spoken of as high or low electromotive force.

Conductors are those metallic substances on which electricity travels. All the metals, including quicksilver, and all their salts in water are conductors.

Non-conductors are substances such as dry wood, resin, glass, silk, dry skin, textile fabrics if dry, etc.

Volts are the units of electromotive force, and a cell is said to have an electromotive force of one volt, one and a half, or possibly two volts. Batteries may give twenty, thirty, or sixty volts, or any greater number according to the number of cells contained.

Volt-meters are clock-like instruments with one pointer for measuring the number of volts.

Amperes denote the strength of the current that has been driven through by the pressure of the volts.

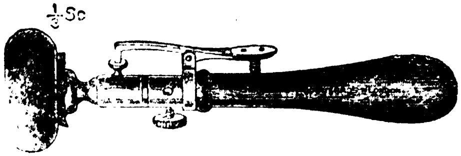


FIG. 264. Electrode.

Milliampere is the thousandth part of an ampere. The human body would be dangerously hurt by a whole ampere passing through it.

Ammeters or ampere meters measure amperes.

Milliampere Meters measure milliamperes.

Rheophores are the pliant wires extending from the battery to the patient. They should always be covered by insulating material.

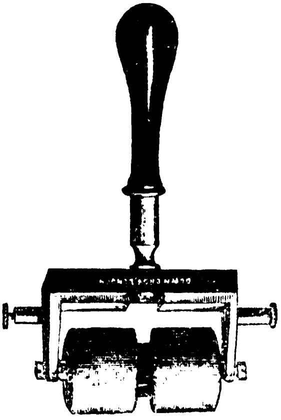


FIG. 265. Roller electrode.

Electrodes are the pads attached to the rheophores which are placed in contact with the patient's skin. They are commonly made of lead, tin, or pewter covered with chamois leather or lint or sponge. They may be of any size from a threepenny bit to several feet (Fig. 264). The active pad or electrode is the one used over the affected area; the pad used to complete the circuit is called the indifferent pad and should always be larger than the active pad. For muscle treatment the indifferent pad should be about 4×7 inches; the active pad should be 2×3 inches and is mounted on a handle, or a roller may be used (Fig. 265). The depth of penetration is relative to the size of the pads; the larger the pad the deeper the penetration. In all forms of medical electricity the pads must be held firmly against the skin; a light touch may cause blistering.

Poles.—This term indicates the two terminal metals of a cell or battery.

Anode denotes the positive pole; **cathode** denotes the negative pole.

Current Reversers are attachments enabling the poles to be altered without detaching any wires. Opening and closing the current means breaking open the circuit and thereby stopping it, or turning it off; closing the circuit between the battery, instrument, and patient, and thereby establishing the flow of current, or turning it on.

Electrical Reactions.—This term is used to denote the response or electric reaction which occurs on application of an electric current.

Reaction of Degeneration.—An abnormal reaction which may occur in certain diseases of the nervous system (Chapter IX). Reaction of degeneration occurs in nerve and in muscle. In nerve it is said to occur when the nerve ceases to conduct either the faradic or galvanic current. In muscle it occurs when the muscle will not contract to faradism, but still contracts to galvanism. This contraction to galvanism is often abnormal, viz.: (1) The muscle may contract to a smaller current than normally (hyperexcitability). (2) The contraction may be sluggish.

General Rules.—Always see that the instrument or battery is in working order before starting the treatment. Test the current by applying it to your own arm before applying it to the patient. Moisten the electrodes with really hot water, otherwise they are cold and uncomfortable when applied to the skin. Salt may be added to the water used to moisten the electrodes, but must not be used in an electric bath for total immersion. Bear in mind that many patients are really frightened of all kinds of electrical treatment, therefore start the treatment gradually and reassure the patient. A nurse giving the treatment carelessly and so giving the patient a shock will probably cause the patient to refuse to continue the treatment.

VARIOUS KINDS OF TREATMENT

1. **Faradism.**—The faradic current is the interrupted current, and is most commonly used to stimulate muscles and nerves and bring about muscular contractions. The various kinds of faradic treatment given are: primary faradic, and secondary faradic. These currents have a cramping and tetanizing effect on the muscles; they are also painful and require to be used very weak to start with.

Method.—The patient is placed on a couch or chair, the part to be treated being uncovered and resting on a dry towel. A bowl containing hot salt solution (strength 1 per cent) or hot water is required. After soaking the electrodes in the solution, or water, the patient's skin is wetted with the same. The indifferent pad is then placed at the back of the patient's neck or over the spine, chest, etc., and covered with a dry towel; it is necessary to keep the pad firmly in contact with the skin either by the patient pressing on it or by means of a bandage. The current is then turned on (closed), the active pad or roller is moved to and fro over the area to be treated (labile treatment); it must not be kept stationary, otherwise the muscles will remain in a state of tetanic contraction. The active pad requires moistening from time to time during the treatment, and it must be moved from muscle to muscle or removed from contact for a second every few seconds in order to allow the muscles to relax. When the treatment is finished the current is turned off (opened), and the patient's skin is dried after removing the pads.

2. **Sinusoidal Current.**—The sinusoidal current is an alternating wave current, and is not interrupted. It is used chiefly for bath treatments, either for one or more limbs, as in the Schnee four-cell baths (p. 744), or for the whole body (p. 743). It may, however, be used instead of the faradic current for treating muscles, as it has a similar effect. In some patients it causes too much irritation of the skin to be used in this way.

3. **Galvanism (the Galvanic Current).**—Galvanic electricity is a continuous flow or current of electricity which can be readily graduated and thus made stimulant or restorative, soothing or sedative. It is useful during the early stages of some nerve diseases to allay pain, and also in some forms of paralysis when the nerve is injured, and when muscles do not respond to the faradic current. When used in cases of paralysis (p. 361) the current may be applied as described for faradic treatment, but the inactive pad must be large and well padded so as to avoid burning the skin. A current of 3–10 m.a. is used, and a contraction is only obtained when the current is interrupted, or when the roller passes on to or off a muscle. When used to allay pain a constant current is given (stabile treatment) and two large thick pads are used. The positive pad is placed over the painful part and the negative pad elsewhere. About 10–20 m.a. are given for 15 to 30 minutes and the current is turned on and off slowly. A sudden change in the strength of the current would give the patient a shock.

4. **Rhythmical Galvanism** consists of constant current with rhythmic breaking. For this treatment a metronome is used. A contrivance of wire dips into a cup of mercury as the metronome beats from side to side with a see-saw movement. It is placed in

the circuit between the battery and the patient by means of a short wire and the rheophore is attached to its other brass terminal instead of the battery. The metronome can be regulated, and is set at the prescribed rate of breaks before connecting with the rheophore.

5. **Combined Current.**—A current consisting of galvanism and faradism together. A battery fitted with the two kinds of electricity is necessary for the treatment. It is given in the same manner as galvanism.

Ionization, or Cataphoresis.—This treatment consists in introducing drugs through the skin close to the affected part by means of the direct continuous current. Large pads consisting of gamgee tissue, or layers of lint and cotton wool, are completely soaked in a solution of the drug prescribed, wrung out so that dripping is prevented but no more, and applied to the affected part. A chain mail electrode is placed over the pad and connected to the proper pole of the current. The pad and electrode are bandaged firmly in position. The indifferent pad is soaked in saline and applied to the back, or if two limbs are affected two active pads may be used. One of the commonest drugs used in this treatment is lithium iodide. The lithium can be introduced at the positive pole and the iodide at the negative.

Other drugs used are: Salicylate of soda, potassium iodide, zinc, salt, and sulphate of magnesia. Treatment through unbroken skin lasts from ½ to 1 hour, and may be used in cases of rheumatism, joint disease, neuritis, warts, etc.

Ionic treatment may be used over ulcers (p. 280).—The ulcer is surrounded with strips of gutta-percha tissue, eight to twelve thicknesses of lint cut to the size of the wound are soaked in a solution of zinc sulphate and placed over the wound. A piece of plate zinc a little smaller is placed over the lint and connected with the positive pole. The indifferent pad is soaked in saline and placed over the spine and connected to the negative pole. A small current is necessary and ten minutes is long enough. Burns may result from these treatments if too strong a current is used, or if the pads are not sufficiently firmly applied to the skin.

High Frequency.—An interrupted current of high power. There are three chief methods of applying high-frequency currents: local application, auto-condensation, and auto-conduction.

1. **Local Applications** can be made directly connecting the patient by means of wires with either end, or with a certain number of spirals of the solenoid; or by approaching him or touching him with an electrode attached to the resonator or bi-polar transformer.

2. **In Auto-condensation, which is the commonest form of treat-**

ment, the patient is placed on a couch which has a backing of sheet metal covered with an insulating mattress of rubber or felt under an ordinary cushion. The metal sheet is connected with one end of the solenoid or resonator; the patient, if connected to earth, becomes oppositely charged to the metal plate. On the couch are two metal handles connected to earth or to the other end of the solenoid; these are held by the patient. At every oscillation of the current the patient becomes charged with electricity. The patient grasps the handles before the current is turned on; after a time warmth is felt in the hands, spreading later to the arms and shoulders, then all over the body. This feeling of glowing warmth persists during the treatment, but stops quickly when the current is turned off. Treatment is given for ten or fifteen minutes, either every day or every alternate day. The effect of this form of high frequency is exhilarating. It relieves depression, dilates capillaries, and relieves high tension. It is used in many nervous complaints. The electric brush discharge may be used from a Oudin resonator. The brush is moved up and down over the affected part, just beyond sparking distance. The physical effect of this treatment is to produce local warmth and glow; the mental effect is often very great and impressive. Glass vacuum tubes are sometimes used in actual contact, most commonly to the face.

Static Electricity is a form of frictional electricity. The treatment may be given locally or generally. For local treatment the part to be treated is uncovered and exposed. If general treatment is given, the patient need not undress. The patient either stands or sits on an insulated stool or chair. The feet or hands are then connected to the prime conductor on the positive side. The patient feels a curious sensation as if cobwebs were touching him. If an electrical comb set on a handle but connected with the ground, or opposite pole of the machine, is presented to any part of the patient's skin, a breeze is felt, and sparks may pass if the comb is held too near. If a brass ball is presented, sparks occur and the muscles are made to move. This produces an invigorating effect. Treatment is given for ten to fifteen minutes.

Electric Baths.—These may be either total-immersion baths or small baths to take one limb. The electrical current may be galvanic, faradic, or sinusoidal. If galvanic, an earth-free machine should be used, such as the Pantostat. For a total-immersion bath a large porcelain bath insulated on a dry floor is required. The inflow of hot water and cold must take place through rubber tubing, which is to be removed from the bath and placed in a vessel to drip before the patient gets into the bath. The water should not be more than 16 inches deep and the temperature should not exceed 99°–100° F. Two copper plates arranged in wooden receptacles are placed in the bath, one at the head, the other at the foot. The patient then gets in and the current is gradually switched on. The rule is that the current should be established before the patient lies down in the water. In addition to the copper plates a cross-bar for the hands is sometimes used. The bath lasts from ten to fifteen minutes. Very large currents are borne in baths, and the raising of such currents must be attended with great care and caution. Electric lamps should not be switched on or off whilst the bath is in progress; fatal accidents have happened by a patient trying to manipulate a lamp-switch whilst in the bath. Salt is not used in total-immersion baths unless the cross-bar for the hands is used and never without direct instruction from the doctor. A local bath is given in a small porcelain bath. One electrode may be placed in the water, the other being applied to the patient's spine.

Schnee's Four-cell Bath is a four-limbed bath. The patient sits on a chair, both the legs are placed in deep porcelain baths made on purpose, reaching nearly to the knees, the arms flexed at the elbows are placed in other baths not quite so deep. Each bath is fitted with a carbon held in place by fitting into a slot, the carbon is connected by terminals and rheophores to the battery. Each bath is filled three parts full of tepid water rendered slightly saline. Care must be taken to see that the limbs are not in contact with the carbons or blistering may result. The current is then turned on slowly until the prescribed strength is reached. The bath lasts from ten to fifteen minutes. Faradic, sinusoidal, or galvanic electricity may be given by this method (p. 741). A nurse should not move about near the patient during the bath if the wires rest on the ground, as shoe buckles, buttons, etc., have a facility for catching them. The sudden breaking of the current when five to ten milliamperes are passing gives a decided shock, and with currents of twenty milliamperes or upwards the shock might be serious. The doctor will give directions as to how the poles are to be distributed.

Intolerance.—Patients undergoing any kind of electrical bath or ionization may show signs of intolerance, with which the nurse should be familiar.

Symptoms.—The patient complains of feeling very hot, is breathless, and perspires freely; the face then becomes very pallid, the patient feels faint and sick and later becomes unconscious. The treatment should be discontinued as soon as the patient complains of feeling hot, or becomes flushed and breathless.

Treatment.—Discontinue the treatment, care being taken not to switch off the current suddenly. Place the patient on a couch with the head lower than the body, open the windows, apply hot-water bottles to the extremities. Brandy or sal volatile may be given and later a cupful of strong coffee.

Radiant Heat and Light Baths are given by means of carbon-filament lamps suspended in a cabinet, or metal cradle, of varying size. The whole body or a single joint or limb may be treated by using the various-sized cradles. (For method see hot-air bath, p. 112.)

CARBON-DIOXIDE SNOW

Carbon-dioxide Treatment.—Carbon-dioxide, carbonic acid, or CO_2 snow was introduced into this country originally by Dr Reginald Morton, and is used very successfully in the treatment of lupus, small rodent ulcers, trachoma, warts, capillary naevi, port-wine stains, and as a stimulant to callous varicose ulcers.

Carbon-dioxide gas is supplied in a cylinder. It is under great pressure and owing to its sudden expansion on being liberated from the cylinder it solidifies or freezes.

Method of preparing the snow.—The simplest method of preparing the snow for use is as follows: An ordinary huckaback towel folded in four lengthwise is rolled tightly round a circular ruler which is then withdrawn. One end of the tube thus made is stopped with a cord, into the other end the nozzle of the cylinder is fitted, the tap of the cylinder is then turned on until the towel feels solid to the touch. A thick pad of lint should be used to protect the hand from the intense cold. The towel is then unrolled and the CO_2 snow is gathered into a brass tube, rammed down tightly, and then hammered. When ready for use the stick or pencil of CO_2 snow should be extremely hard; it may then be cut or trimmed to the necessary shape with a penknife. The effect of CO_2 snow is practically that of a frost-bite, and the part treated is dressed with either collodion or boracic ointment as directed. Various apparatus more or less expensive have been invented for making solid CO_2, but this method answers admirably and has the advantage of being extremely simple, inexpensive, and there is no possibility of its getting out of order.

MASSAGE

The Masseuse.—*General qualifications necessary.*—Special training is necessary before undertaking any work in massage or medical electricity. It is an advantage, although not absolutely essential, that the person should be a fully trained nurse in addition to the special training in physiotherapy. Good physique and good health. Cleanliness in every particular. Intelligence and refinement. Good temper and forbearance. Conscientiousness and zeal in carrying out treatment. Intelligent interest in the patient's welfare; absence of fuss and undue haste. A happy cheerful disposition, with a pleasant contented face; vivacity, dexterity, readiness, ability, and punctuality are indispensable. The perfect hand for massage should be soft, smooth, fine, dry, and fleshy, of good normal temperature, and possess good muscular power, suppleness, pliability, flexibility, firmness of grip, and warmth.

General points to be observed when giving treatment.—Have the patient completely at rest and comfortable so that all muscles are relaxed. Avoid draughts from open windows, and ensure privacy. The temperature of the room should be 60°–65° F. Keep the patient covered and warm; the part being treated should be placed on a warm blanket and covered with same when finished in order to maintain the temperature, which, after efficient massage, should be raised, the limb having a pink appearance and feeling warm to the touch. Talking during the treatment should be discouraged; it is impossible for the masseuse to devote herself to amusing the patient whilst concentrating her mind on her work, which is essential for effectual treatment. After treatment the patient should be made comfortable and warm, the window opened, then left to rest for 30 minutes.

Sternol wax (p. 756) applied before the treatment renders the treatment more effectual, and prevents subsequent swelling of the limb which may occur after treatment of cold, paralysed limbs. Opinions differ as to whether any lubricant should be used, and the masseuse must be guided in this by the doctor for whom she is working whether she is of the same opinion or not. Any of the following methods are used: (1) Powder used on the masseuse's hands alone, or on the patient's skin in addition. (2) Oil to lubricate the hands. (3) Vaseline to lubricate the hands. (4) Lubrication of the patient's skin after treatment is given; this helps to maintain the warmth of the part. (5) Massage with a medicinal oil or ointment. (6) Massage is sometimes ordered to be given under water. The temperature of the water should be about 105° F. The limb is immersed in a bath, or the water is directed over the limb by means of a continuous spray. This wet massage is useful in cases of stiff joints, and limbs which are much below the normal temperature.

Definition of massage.—The application of living matter to living matter in various ways with varying degrees of energy according to the resistance to be overcome. Every movement made upon the human body represents so much energy imparted to the tissues, and the displacement of so much resistance, so that all manipulations of whatever kind are represented by a transference of energy—'energy versus resistance.' It is important to remember that energy travels in lines of least resistance, and to employ it in direct ratio with the requirements of the case. The energy required to overcome the resistance in the muscles of an athlete would be vastly different to that required to overcome the initial resistance in the muscles, say, of a patient just recovered from an attack of typhoid fever, and, again, the energy necessary for the head and neck is distinctly different to that required for the calves and buttocks. The transference of various degrees of energy produces decidedly different effects (stimulating or soothing). Each movement or manipulation has its own use, and an efficient masseuse only uses a stimulating movement to stimulate, or a soothing movement to soothe. Too slow work is annoying to the patient, but smooth even work is inconsistent with great speed. The fingers should always be extended but not separated, the tips of the fingers should not be used in any movement. A crab-shaped hand shows incompetency.

The terms used to denote the various forms of manipulation are effleurage, pétrissage, tapotement, and vibrations.

1. **Effleurage, or Stroking.**—This term is applied to all stroking forms of movement—light movements free from pressure, surface movements. In all cases the massage treatment should begin and end with this movement. Effleurage movements influence particularly the peripheral ends of the nerves. Effleurage may be divided into two kinds, gentle and firm. Gentle effleurage is used for relaxing muscular spasm caused by irritation to the nerves. Firm effleurage is more generally used. Firm pressure is applied as the hand passes smoothly upwards, thus forcing onward the impure blood from the superficial veins and so aiding circulation. It is usual in the majority of cases to use firm effleurage as the first movement, completing the treatment with gentle effleurage. Effleurage may be given fairly quickly, but without jerkiness, the movement should begin and end slowly. When the hand has been brought into contact with the skin it must not be removed but should repeat the upward movement, or glide into the second movement, without losing contact with the skin, otherwise a slight nervous shock results on replacing the hand. These movements are in effect essentially soothing, calming, tranquillizing, and sleep-giving.

2. **Pétrissage.**—This movement consists in kneading, squeezing, and working into the deep tissues by bringing or massing them

together; and is used to imitate the normal muscular action, and gives very satisfactory results. The same precaution is necessary as in effleurage, not to lose contact with the skin by removing the hand. In giving pétrissage the muscles are drawn away from the bone and from each other.

Pétrissage is divided into five movements: (1) Kneading; (2) rolling; (3) ironing; (4) picking up; (5) friction.

Kneading is done with the whole of both hands, or one hand may be employed to steady the part whilst kneading with the other. Fingers or thumbs are used when working deeply between bones, as between the ribs.

Rolling.—The limb is rolled between the palms as if it were dough, the effect of this is to stretch the muscles which lie nearest the bone. This movement is used on the limbs.

Ironing.—Both hands are laid on the surface at some distance from each other, and are then brought together closely and gently interlocked with only a slight alteration in their position on the skin, thereby bringing the underlying muscles together and moving the layers of muscle on each other. This movement is used on the back and shoulders.

Picking Up is a powerful movement in which masses of muscles are grasped with both hands and drawn in opposite directions alternately. Contact must not be lost except when the muscle that requires stretching is very small. Used on the limbs or trunk.

Friction.—In this movement the muscle is moved against the bone or underlying tissue instead of being drawn away from it. The movement is circular and made with the pads of the fingers or thumbs. This movement is performed with considerable rapidity. It is used chiefly over nerve-roots and near the bones to stimulate nerves or to break down superficial adhesions.

Pétrissage is used in cases where it is necessary to improve the circulation in order to aid the nutrition of muscles, bones, and articulations; to stimulate the lymphatics in cases of oedema and effusion, which may be dispersed by this means; in cases of paralysis due to brain lesion, to improve the condition by imitating the natural stimulus to the motor centres, which is necessary to preserve their vitality.

3. **Tapotement.**—All movements included under this term are percussive, successive, and concussive in nature and are intended to have the opposite effect to effleurage. They act principally upon the nerve-trunks. In these movements the hand is not kept in contact with the skin. The mechanical effect of tapoting a part is to bring about vibration in the part, to convey to the tissues a series of shocks. It is used to stimulate muscles and make them

contract, to relieve congestion by attracting blood to the surface, to help in the absorption of toxins by drawing lymph to the part and increasing phagocytosis. This movement is harmful in cases of muscular spasm, such as spastic paralysis, injuries, neuritis, Raynaud's disease. Tapotement is divided into four different movements. These movements must be made entirely from the wrists or injury may result:

(1) **Hacking** is done with the ulnar borders of the hands used alternately; the wrists are held close together.

(2) **Pounding** is tapotement with the closed hands, using the ulnar borders of the hands.

(3) **Clapping** is done with the hand slightly hollowed and the fingers extended, the thenar and hypothenar eminences and the pads of the fingers being rapidly clapped on the skin.

(4) **Flicking** is a complicated rotary movement which requires great practice. The thumb is drawn down beside the muscles being worked on, and a quick rotary movement of the wrist brings the thumb and fingers sharply to and fro, striking the muscle with a characteristic flicking noise. Tapotement may be applied to any part of the body but is especially applicable to the back and large masses of muscle.

4. **Vibrations** are given either with the whole hand, with the first phalanx of the index fingers, or with the pads of all the fingers. The movement consists in making rapid vibrations over the part. It is used over nerves and has a stimulating effect.

General Massage is the term used when massage is given to the whole body, that is, the trunk and limbs. It consists of the movements already described, which are given in the order in which they have been mentioned; manipulations are then given to the full extent possible of each joint followed by gentle effleurage, this completes the work on each limb. The massage may be done in the following order: right leg, left leg, left arm, right arm, chest and abdomen, neck and back. Forty minutes must be allowed for a case of general massage. It is best to use the movements in the same order, omitting any that are not suitable for special cases. General massage may be ordered for the following conditions: Melancholia (p. 403), obesity (p. 313), wasting, chorea (p. 389), insomnia (p. 358), heart disease (p. 265), neurasthenia (p. 394), hysteria (p. 392). Local massage is given in the following conditions:

Fractures.—Massage is used in the treatment of the later stages of fractures (p. 531). The masseuse must take her instructions from the surgeon in charge of the case, the treatment requires to be adapted to each individual case In the new Böhler treatment of fractures (see p. 532), massage is not employed until firm union of the bone obtains. The chief object of massage then is to strengthen and restore tone to muscles which have not been freely used.

Points to remember in the treatment of fractures are: The work for the first three or four days should be superficial, effleurage should be the only massage movement employed, and should be begun at some distance from the seat of the fracture, following the direction of the venous blood towards the heart. Manipulation must not be given until the surgeon gives permission, when given it should be very limited in extent for some time, but later should be increased.

Dislocations (p. 544).—Massage is frequently ordered as soon as the dislocation has been reduced (i.e. 5–7 days), in other cases it may not be ordered until the inflammation has subsided; in a few cases it may be ordered before reducing the dislocation to relax the spasm. Effleurage is given for the first four to seven days or until the inflammation has subsided. Later pétrissage, and as soon as all effusion has subsided very gentle manipulations are given, though any movement similar to that which produced the injury must be avoided. After the fourteenth day vigorous massage for fifteen minutes is given. At the end of three weeks active movements are given.

Sprains (p. 543).—Effleurage is given twice a day until all effusion has disappeared. Massage will then consist of all movements to the parts above the injury which can be given without causing pain; the whole surface of the muscles which move the joint must be dealt with, followed by effleurage over the injury. Pétrissage is introduced as soon as it can be given without pain. On the third day, or as soon as effusion has subsided, the joint may be gently flexed and extended, taking care to avoid any movement similar to that which caused the sprain. Active movements may then be begun and massage reduced to once a day, tapotement and other more vigorous movements being now given. Massage is continued for about three weeks, after which the cure should be complete. Rise in temperature, deformity, or crepitus (p. 527) should be reported to the surgeon.

Stiff Joints.—In giving massage for stiff joints the parts above the articulation must first be thoroughly rubbed, then all movements that are useful for stretching and for breaking down adhesions should be given over the matted parts. Resistive exercises to the joints above and below the stiff joint are very useful. Pain will probably be caused by trying to get movement in the stiff joint, but perseverance is necessary. Any heat or swelling of the joint should be reported to the surgeon.

Massage for Deformities such as Talipes (p. 621), **Scoliosis** (p. 620), **Torticollis** (p. 620), **etc.**—The point to bear in mind in these cases is that stimulating movements must be used when treating the weakened over-stretched muscles, and soothing movements (effleurage only) to the contracted or spastic (see glossary) muscles. Active and passive exercises are also given in these cases.

Neuritis (p. 365).—Massage is not ordered during the acute stage, as it causes too much pain. When given, effleurage only should be used to begin with, later petrissage; tapotement is then gradually introduced, and finally vibrations. Manipulations are given when pain is not caused by the treatment.

Heart Disease (p. 265).—The pulse should be counted both before and after the treatment, and signs of distress are indications to stop the treatment immediately, these are pallor, palpitations, dyspnoea, perspiration. All unnecessary exertion on the part of the patient must be avoided. Nourishment should be given and the patient encouraged to sleep afterwards. Effleurage and slow rhythmical pétrissage may be given to the limbs, and if the patient is well enough slow abdominal massage may be given. Back massage is very valuable but is not possible in many cases; when it is given, if the patient is in a propped-up position it may be done with the patient leaning forward on pillows or a bed-table. Manipulations require great discretion, the patient's arms should not be raised above the level of the shoulders. The patient should not be turned on to the left side for treatment.

Insomnia (p. 358).—Massage is frequently ordered for the treatment of habitual insomnia. Before commencing, everything should be made ready for the night, and a cup of Benger's food or cocoa should be at hand, also a warm blanket, hot bottle, and warm nightgown. It is best to work in a subdued light. Vigorous massage of the feet and legs should be given and a hot-water bottle placed near them, this draws the blood from the brain; the arms may be vigorously rubbed, the trunk movements should be chiefly effleurage and friction. The patient should then be dressed and drink the hot food; this is followed by head and neck massage, after which the patient will probably be asleep.

Constipation (p. 221).—*Abdominal* massage is given for this condition. The movements should be deep and over the colon, working in the same direction as that taken by the contents of the colon, starting either from the caecum or sigmoid. In order to obtain relaxation of the abdominal muscles, which is important, the patient should be propped up if possible with the knees flexed over a pillow; the masseuse must have warm hands.

Paralysis (p. 361).—Massage in these cases is directed toward improving the circulation of the part and exercising the muscles to prevent wasting, passive movements are given to prevent stiff joints. Spastic conditions require soothing movements only. Flaccid conditions require stimulating movements.

BREATHING EXERCISES

Breathing exercises are used to re-educate the patient in the correct way of breathing after certain diseases and after some acute conditions, i.e. pneumonia, pleurisy, etc., and to improve the tone of the respiratory muscles. They may also be ordered before a general anaesthetic is given, or after operations on the throat, nose, lungs, and chest. In some forms of stammering they are helpful, and in some cases of insomnia relief is obtained by their use.

1. Recumbent position, head slightly raised, arms close to the sides. Gentle breathing is now practised which is entirely confined to the ribs and diaphragm. The extreme upper part of the chest, together with the shoulders, remains quiescent. There must be no movement of the collar bone. For the purpose of resistance, a lightly diffused pressure, evenly distributed, is maintained over the seat of the diaphragmatic action.

2 *and* 3 consist of the same movement sitting and standing without the pressure.

4. Same movement as No. 1. A full, deep inspiration is taken, the diaphragm is then fixed (this is done by holding the breath), and then suddenly released by a forcible expiration.

5 *and* 6. Same as 4 in sitting and standing position.

7. Recumbent position. Take full inspiration (when the diaphragm is well down and the abdomen protruded, fix the former), then say the first four or eight letters of the alphabet and suddenly expel the air.

8 *and* 9. Same as 7, sitting and standing.

10. Recumbent position. Take full inspiration and whilst doing so raise two light dumb-bells from each side of the head to a half angle with the shoulders.

11. Recumbent position. Take a quiet and prolonged inspiration through the nose, followed by expiration through the mouth. During the latter place a finger close up to and almost between the lips, and endeavour to control the exit of air without warming the finger.

12. Take a quiet, prolonged inspiration, then forcibly expire.

13. Take a hurried inspiration, then slowly expire with the finger to the mouth.

14. In standing position; arms by the side, with dumb-bells,

Raise dumb-bells at arm's length over head during inspiration and lower to sides during expiration.

15. Recumbent, sitting, and standing positions. Take series of light respirations (about 10 in each position) at about the rate of 36 to the minute.

16. Take breath and gradually expire for about 5 seconds, then take a hurried expiration for five seconds, then a deep breath and gradually expire.

Patients not allowed to stand omit the standing exercises.

Active Exercises.

1. Take the fullest possible thoracic inspiration, followed by ordinary expiration.

2. Expire to the utmost, bending body somewhat forward, and then take ordinary inspiration, resuming the vertical position.

3. Take fullest possible thoracic inspiration, then expire to the utmost, bending body forward.

4. Take deep lower thoracic inspiration followed by deep lower thoracic expiration.

5. Stand, legs well apart, take deep abdominal inspiration, followed by passive expiration, viz. one resulting merely from recoil.

6. Stand, legs well apart, take deep abdominal expiration. The latter is effected by retracting the belly by means of the transverse muscle fibres of the anterior abdominal wall.

7. Take deep abdominal inspiration, then lower thoracic inspiration and finally deep thoracic inspiration, lifting the clavicles to the utmost. Expire in the reverse.

8. Take a deep thoracic inspiration, follow this up by deep abdominal expiration, and finally deep thoracic expiration.

9. Sitting, fold hands on lap, flex body as far as possible forward. Now take deepest possible inspiration with closed mouth, then gradually raise body, lift arms over head and take fullest thoracic inspiration: after this passively expire (see No. 5) with open mouth, letting arms drop suddenly. Expiration should not proceed beyond the limit of ordinary expiration and should not occupy more than one second; inspiration not more than six seconds.

10. Patient standing is requested to blow out quickly through small opening made by pursing the lips. At the same time he bends his head, and the dorsal portion of spine, whilst with outspread fingers he compresses the sides of the thorax. Having done this, the fingers are interlaced behind the neck, the mouth closed, and a very slow and prolonged inspiration taken through the nostrils, while at the same time the spine is slowly extended.

The object of placing the hands behind the neck is to bring all the muscles of extraordinary inspiration into play.

This exercise is especially useful for expanding the chest.

Swedish Exercises are used in conjunction with massage, and consist of various exercises adapted to strengthen weakened muscles and overcome resistance in contracted muscles. They can only be learnt by taking a course of instruction which extends over several weeks. They are found to be very useful in the cure of certain diseases after the active stage is over, such as spinal deformities, paralysis, etc.

SPECIAL TREATMENTS

Treatment of the Amputation Stump.—The immediate post-operative treatment is described on p. 475.

In order to hasten the subsidence of oedema and to prevent deformity, which cause delay in fitting the artificial limb, two factors are necessary: (1) correct bandaging, (2) exercise.

Bandaging will assist the normal shrinkage of the stump, and help to obtain a satisfactory shape for limb fitting. Exercising the stump helps to restore the tone of the muscles, thus preventing muscular contractures, and assists in tissue reduction of the stump.

Massage has proved to be inadvisable; it does not reduce the oedema, but rather irritates the nerves, causing pain and very often phantom limbs. It should therefore not be given at any stage during recovery.

(1) The modern method devised by the Ministry of Pensions and adopted by the E.M.S. is to bandage the stump with crêpe bandages from the time the stitches are taken out. It has been proved from records compiled at Roehampton that an above-knee stump requires only three weeks' bandaging to render it fit for measurements to be taken for an artificial limb. Thus with this above-knee site actual limb-fitting can take place in less than 8 weeks from the day of amputation, resulting in a great saving of time and expense, and the earlier return of the amputee to work.

In bandaging above-knee stumps it is imperative to use crêpe bandages 6 inches wide. At present they are not made long enough, so that two have to be sewn together. The bandage must be wound tightly and evenly, otherwise the necessary firm application to the stump cannot be obtained (Fig. 266). The end of the bandage must be applied to the upper front surface of the stump and be held securely by the patient's thumbs. It is then passed down the front of the stump, back over the end, pulled tightly with even pressure to the upper part of the posterior surface of the stump, and held by the patient's fingers. This process is repeated by bringing the bandage down the back of the stump, over the end to the starting-point—still being held by the patient's thumbs—and drawn down over the end to the back of the stump.

The patient must not allow the tension to slacken in the bandage, which thus supports the tissues in the end of the stump. The bandage is next applied round the upper part of the stump to hold the first applications, and firmly enough to allow the patient to remove his hands. It is brought round the end of the stump very tightly so as to compress the tissues, but not too tightly round the upper part. If the bandage was finished off in this manner it would tend to slip down and off the stump when the patient walked about. To prevent this it is applied round the waist as shown in Fig. 266, No. 7, and finally round the stump (Fig, 266, No.8). Particular care should be taken that the crossing of the bandage on itself when applied round the waist occurs at the side of the body and not on the front, otherwise there will be a tendency to flex the stump. This bandage should be reapplied three or four times a day to take up the new shape which results from reduction of the oedema. Figures are available which show that stumps treated in this way have uniformly shrunk 2 inches in circumference in less than 14 days, thus rendering limb-fitting possible.

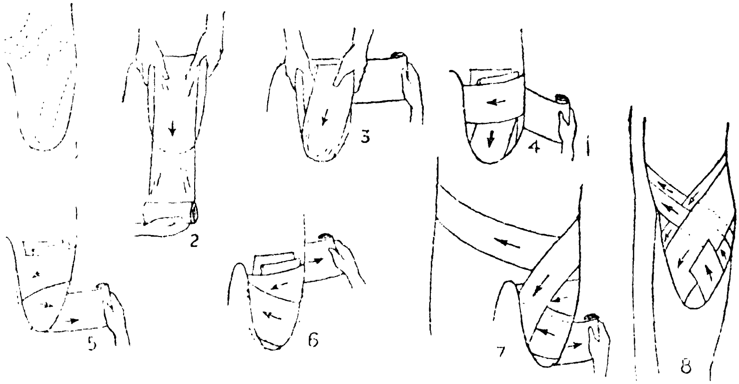


FIG. 266, 1–8. Bandaging the stump.

The application of a 4-inch bandage to an above-knee stump is useless. Furthermore, the method of applying a crêpe bandage tightly at the upper part of the stump and bandaging downwards will retard the reduction of oedema because it imposes a constriction on the upper part.

To treat a below-knee stump a 4-inch crêpe bandage is applied as in the above-knee method. Three slings are used to support the oedematous tissue, and the bandage is applied tightly and firmly around the end. The bandage is taken above the knee to prevent it slipping off the stump, but the front of the knee over the patella is left free so as to afford mobility to the knee-joint.

(2) *Stump Exercises.*—After the stitches have been removed and the wound is healing, active exercises should be started whilst the stump is still bandaged. For an above-knee stump the exercises described below can be given. For a below-knee stump the full movement of the knee should be maintained and exercises given for the thigh musculature and hip joint. If the patient is still in bed the exercises may be given with the cord passing over a pulley attached to a Balkan beam. Arm stumps: the patient is encouraged to exercise the musculature and joints from a few days after the operation.

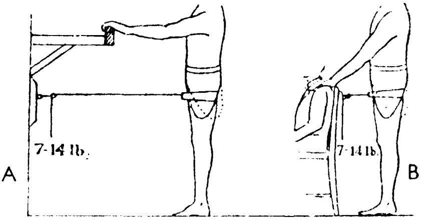


FIG. 267. Exercising the stump.

A recent development in the care of stumps after amputation is a course of exercises adopted to re-educate the remaining muscles of the stump and thus prepare it to control the artificial limb. A narrow sleeve, about 4 inches wide at the back and 2 inches at the front, from which a cord passes over a pulley and suspends a weight of 7 to 14 pounds, is placed on the stump as shown in Fig. 267A. The stump is extended against the pull of the suspended weight to assist the musculature in regaining its strength—the weights, rate of exercise, and duration varying with the increase in muscle tone. The adductors are similarly exercised by the patient's standing with his side toward the pulley, the stump being drawn towards the midline of the body. If the patient is at home the exercise can be carried out by allowing the cord to pass over the back of a chair upon which somebody is sitting to steady it (Fig. 267B).

Sternol Paraffin Wax.—Treatment with hot paraffin wax has proved very effectual as a preliminary to massage, manipulation, or electrical treatment. Benefit from its application is derived when the patient is suffering from any of the following conditions: stiff joints, Dupuytren's contraction, contracture after operation, congestion, pain accompanied by swelling of the part, or cold discoloured limbs as in infantile paralysis where the circulation is defective.

The hot wax application warms the limb or joint right through, improves the blood circulation of the limb, relieves congestion, and softens the tissues, thus enabling the masseuse to manipulate the deeper tissues more easily and efficiently, and with greater comfort and benefit to the patient.

Method.—A sufficient quantity of Sternol paraffin wax is placed in a footbath, pail, or bowl, and melted over heat. The melting point of wax is 120° F. It is used at a temperature of 115°–120° F.

The affected limb or part, having been thoroughly cleansed by washing, is immersed in the hot wax for 5 minutes. The limb is then lifted out and held over the bath whilst the surplus wax is allowed to drip off—any excess being smoothed off with a spatula. The wax will now have set, completely enfolding the part.

The limb is next wrapped in grease-proof paper, entirely covered with a warm dry towel, and finally with a warmed woollen blanket to form a pack.

The limb is then placed on a couch or table, with the patient in a comfortable resting position. If the atmosphere is cold a radiant-heat lamp may be used, but this is not a necessity.

The pack is left for 15–30 minutes and then removed. After taking off the coverings—which are all kept to be used again—the set wax is peeled off. This is easily done if the top edge of the wax is loosened. The skin is then washed in hot water and dried if electrical treatment will follow, otherwise drying will suffice before further treatment, if any, is given.

The wax after removal is sterilized and added to that in the bath.

It is important to wash the limb after immersion in wax if electrical treatment follows, as the wax acts as a non-conductor.

The treatment may be applied once or twice daily, and is not necessarily followed by either massage or electrical treatment.

Voluntary movements are more easily accomplished by the patient and with less pain after the wax treatment. It is also soothing and comfortable.

Care is needed if there is any loss of sensation, as these cases burn more easily than patients with normal sensation.

CHAPTER XXV

DRUGS AND THEIR ADMINISTRATION

An elementary knowledge of the action of drugs is of importance to every nurse. Increased knowledge of the potency of drugs also presses home the danger of any but qualified men and women taking upon themselves the responsibility of prescribing, a fact to be borne in mind by nurses.

It is impossible to deal adequately with the subject in a few pages, therefore elementary information only will be given here; a Materia Medica for nurses should be studied for further information. (For Dangerous Drugs Act, see p. 847.)

General Points concerning the giving of Medicines.—1. Drugs should in every instance be kept in a cupboard and away from the patient's reach.

2. Poisons should be kept in a separate cupboard under lock and key.

3. Drugs for internal administration should be kept in a cupboard other than those used for external application.

4. All drugs require to be kept tightly corked, as otherwise they deteriorate. Some drugs require to be kept in the dark.

5. *Labels.*—Every receptacle containing a drug of any description should be labelled. Drugs dispensed for internal administration require labelling as follows: patient's name, dose, and frequency of administration; a 'shake the bottle' label if this is necessary; and a 'caution' label if the mixture contains poison. The medicine is often dispensed in bottles according to the dose to be taken, for instance, a 2-oz. bottle for drachm doses; a 6-oz. bottle for ½-oz. doses; an 8-oz. bottle for 1-oz. doses; and an 8-oz. bottle for a mixture which is to be given frequently, such as every four or two hours; in other cases the number of doses to be sent is given on the prescription and the bottle varies accordingly.

6. Drugs for external application should be dispensed in coloured bottles, differently shaped from those used for medicine. The label should contain the name and strength of the preparation, and a poison label if poisonous. Instructions as to the method of application are usually given by the doctor to the nurse.

Dosage.—The dosage of a drug is modified by the following conditions: age, method of administration, idiosyncrasy, habit, cumulative action, disease, and race.

1. *Age.*—An ordinary dose is that which would be usually given to an adult, i.e. between the ages of twenty and sixty years. Old people and children require relatively smaller doses. To calculate the dose for children from one to twelve years the following formula is used: add 12 to the age, and divide the age by the amount thus obtained; thus for 8 years $\frac{8}{8+12}=\frac{2}{5}$ of an adult dose.

2. *Method of administration.*—The usual dose is that which is given by mouth, hypodermic doses are smaller, and rectal doses rather larger than the usual dose.

3. *Idiosyncrasy.*—Some persons are powerfully affected and show symptoms of poisoning by most minute doses of certain drugs, e.g. quinine, mercury, etc., or certain lotions may produce toxic symptoms, such as carbolic, iodine, perchloride of mercury (see douches, p. 71; for symptoms of intolerance see p. 771).

4. *Habit.*—A person who is habitually under the influence of a drug, e.g. opium, purgatives, arsenic, etc., may require a larger dose.

5. *Cumulative action.*—Certain drugs if taken for some time without interruption tend to accumulate in the system, and symptoms of intolerance or poisoning may occur (see functional poisons, p. 770). See also tapping, p. 89.

6. *Disease.*—The action of drugs is profoundly modified by the disease from which the patient is suffering.

7. *Race.*—As a rule, coloured races stand higher doses of most drugs than white races.

Administration of drugs.—Drugs may be administered in any of the following ways, and are absorbed into the system most quickly by the various methods in the order mentioned: (1) Intravenous infusion; (2) inhalation (local effect); (3) hypodermic and intramuscular injection; (4) by mouth; (5) by rectum; (6) by inunction. (For method of administration see Chapter III.)

The essential points to be borne in mind by the nurse when administering drugs are: to be punctual and regular; to measure accurately; to give at the prescribed time and in the prescribed manner; to note the effect and to be able to detect and report signs of intolerance (p. 771). The measuring of all concentrated drugs and poisons, such as drugs used for hypodermic injections and sleeping-draughts, etc., should be checked by a second person.

To measure and prepare a Dose of Medicine.—Read the label; shake the bottle; uncork the bottle, holding the cork in the little finger of the right hand; smell the mixture; pour out the medicine from the side of the bottle opposite to the label into a measure glass; re-cork the bottle; read the label and verify the dose in the glass; replace the bottle in the cupboard after wiping the neck if necessary. A nurse should train herself to know the smell of all the drugs she uses, in this way a mistake is often avoided.

The glass should be taken to the patient on a tray, avoid touching the rim of the glass. When an effervescing mixture is to be given a 4-oz. glass should be used for the medicine, the acid to cause effervescence being put in a separate glass and emptied into the larger glass at the bedside. Mixtures containing drugs which deposit on standing should be stirred with a glass rod or spoon immediately before being taken. Powders, pills, tablets, cachets, etc., should be taken to the patient in a medicine spoon on a tray, and never in the fingers or hand. Medicine glasses and spoons should be washed immediately after use.

Drops may be given in a little cold water or on a lump of sugar.

Powders may be given dry upon the tongue followed by a drink of water, or they may be placed between bread, in jam, or dissolved in hot milk or water, if soluble.

Cachets are moistened with cold water immediately before being taken and swallowed with a drink of water.

Pills, tablets, etc., are swallowed with a drink of water; tablets may be crushed and taken as powders.

Acids and drugs which may injure and stain the teeth are taken through a glass tube, or through straws, the mouth should then be rinsed out.

Oils.—These, such as cod-liver oil, may be given plain in a medicine spoon. Castor oil may be given in the same way, or sprinkled with sugar for small children. For adults, the following is the best method: Heat and thoroughly moisten the medicine glass with boiling water, leave two drachms at the bottom, pour on the required dose of oil, then one drachm of lemon juice or brandy, and shake the glass gently to cause the oil to float in the middle; direct the patient to drink the medicine quickly, not sipping it, and nothing but the lemon or brandy will be tasted. A slice of lemon to suck afterwards cleans the mouth from any unpleasant oiliness. To wash the glass, place it under running hot water for a minute or two, then wash in hot soda water.

Drugs are ordered to be given at a certain time according to their action and the purpose for which they are required.

Aperients are taken last thing at night or first thing in the morning before food. Saline aperients are given in the morning.

Sleeping-draughts are given last thing after the patient has been settled for the night, except in one or two instances when the drugs take some time to act, such as sulphonal, medinal, these are given 2–4 hours before bed-time, or as ordered.

Drugs taken before food are: Bismuth, gentian, bitter tonics, and drugs to help in digestion and promote appetite.

After food.—Iron tonics, stimulants, disinfectants, and all medicines unless otherwise stated.

Prescriptions.—A nurse should always know the drug she is giving, also its strength and the toxic symptoms which it may cause (p. 771); she should, therefore, be able to read and understand prescriptions. (For measures and symbols commonly used see p. 842; for Latin abbreviations used in prescriptions see p. 847.)

At the top left-hand corner of the prescription is the symbol ℞ which means 'take of' and refers to the drugs mentioned below it. At the end of the prescription the symbol Sig. ('let it be written down') denotes the instructions to be written on the label. When using the symbols to denote apothecaries' measure the numeral denoting the quantity follows the sign and roman figures are used, thus, ♏iv. With the symbols denoting metric measures, the numeral is written first in arabic figures, followed by the abbreviation, thus, 15 gm.

Measurement of Drugs.—It must be borne in mind that the minim is not the exact equivalent of every drop, as all drops are not alike; the size of the drop depends on the shape of the vessel from which it is being dropped, and on the adhesiveness and consistency of the fluid dropped. Tables giving the exact number of drops to a minim of any drug will be found in most text-books on materia medica. Where the sign minim is used with an order, the drug must invariably be measured in a minim measure. It is inaccurate to use a minim measure if the sign *gutta* is used, these drugs should be dropped from a drop-bottle (in which they are usually dispensed) or a glass pipette should be used. The domestic measures (p. 841) are not sufficiently accurate to be used when measuring drugs, but are useful for measuring foods, etc.

Measure glasses.—In administering medicines graduated glasses are used, on which the measurements correspond exactly to the apothecaries' fluid measure (p. 841). Spoons and medicine cups are not so accurate and should not be used for measuring fluids. Drugs to be administered by mouth, or for making lotions, etc., must invariably be measured, not guessed.

Methods of reckoning the Amount of Drug required in making Solutions of Various Strengths.—Apothecaries' weight (p. 839), one ounce contains 480 grains, in apothecaries' fluid measure (p. 839) the ounce contains 480 minims; in order to facilitate reckoning in the making of solutions the ounce may be taken to contain 500 grains or minims respectively. 1 per cent, or 1–100, means one part of the drug in ninety-nine parts of water. (This approximation is not sufficiently accurate for hypodermic solutions. See fractional doses.)

To find the amount of drug required: 1 per cent solution.—To make 1 ounce of a 1 per cent solution 5 grains of the drug will be required to be made up to 1 ounce with water. To make *stronger solutions* with higher percentages, multiply 5 by the required percentage, thus:

2 per cent solution.—5×2=10; therefore 10 grains–1 oz.=2 per cent solution.

Weaker solutions.—Divide 5 by the required percentage, thus:

¼ per cent solution.—5÷4=1¼, therefore 1¼ grains–1 oz.=¼ per cent solution.

To find the equivalent in parts corresponding to the percentage, i.e. 1–20, 1–60, etc.—Divide 100 by the percentage, thus: to find the equivalent of 5 per cent solution, 100÷5=20, that is 1–20 is the equivalent of 5 per cent.

To make one pint instead of one ounce of solution.—Multiply the grains, or minims, required to the ounce by 20, thus: to make 1 pint of a 2 per cent or 1–50 solution 200 minims will be required as 5×2=10, and 10×20=200.

To decrease the strength of a given solution.—Increase the quantity of water. To find the required quantity of water to add, divide the strength of the diluted solution by the strength of the stock solution, thus: to make a 1–60 solution from stock solution 1–20, 60÷20=3, that is 1–3 or one part solution to 2 parts of water; or 1–500 to 1–2000, 2000÷500=4, that is 1–4, one part of the stock solution to 3 parts water.

Metric System (p. 839) (N.B.—The term c.c. is used instead of the official mil to prevent confusion—see p. 841).—The amount of percentage specified gives the amount of drug in grammes necessary to use for every 100 cubic centimetres (c.c.). Thus 1 gramme is required to make 100 c.c. of a 1 per cent solution; 5 grammes–100 c.c. for 5 per cent solution. To make larger quantities than 100 c.c., multiply the percentage by the number of 100 c.c. required, thus: to make one litre (1000 c.c.) of a 5 per cent solution 5×10=50 grammes to 1 litre.

To prepare fractional doses from preparations of a different fractional value, i.e. a dose of $\frac{1}{80}$ may be ordered, whilst the stock solution is $\frac{1}{100}$ in a certain stated number of minims.

Method.—To find the required dose the strength of the stock solution is multiplied by the number of minims in which it is contained, and the result is divided by the strength of the dose required, thus, if $\frac{1}{80}$ of a grain is the prescribed dose, and the stock solution is $\frac{1}{100}$ grain in every 10 minims, 100×10=1000: 1000÷80=12½, therefore 12½ minims contain $\frac{1}{80}$ of the drug. Where drugs are put up in tablet form, the same method may be carried out, the tablet first being dissolved in a given number of minims. Drugs for hypodermic injection are most commonly prescribed in fractional doses (see table of hypodermic drugs, p. 844).

For table of weights and measures see p. 841; table of antiseptic solutions and their strengths see p. 845.

VARIOUS PREPARATIONS OF DRUGS

Drugs contained in the British Pharmacopoeia are termed 'official,' other drugs are called 'unofficial.' Drugs are prepared in many different forms, the following are some of the most usual preparations:

1. Liquid Preparations.—*Decoctions, decocta.*—Watery solutions prepared by boiling.

Fluid extracts, extracta fluida.—Concentrated tinctures or alcoholic extracts.

Infusions, infusa.—Watery solutions prepared without boiling.

Inhalations, vapores.—Preparations of volatile drugs.

Solutions, liquores.—Preparations of drugs dissolved in water.

Syrups, syrupi.—Preparations made with sugar and water, sometimes containing alcohol. Simple syrup is sugar and water.

Spirits, spiritus.—Solutions of volatile substances in spirit.

Tinctures, tincturae.—Solutions of drugs in spirit.

Vinegars, aceta.—Preparations made with dilute acetic acid.

Wines, vina.—Tinctures made with wine instead of spirit.

Oils, olei.—Oily products obtained by expression or distillation.

Oleates, oleata.—Preparations made with oleic acid.

Glycerines, glycerina.—Drugs dissolved in glycerine.

Mucilages, mucilagines.—Watery solutions of a gum.

Mixtures, misturae.—Watery preparations in which the active ingredients are dissolved in water, or, if insoluble, are suspended in mucilage, then flavoured and sometimes coloured.

Liniments, linimenta.—Drugs incorporated with oil or spirit to be rubbed into, or otherwise applied to the skin.

Pigmenta.—Drugs prepared for painting on the skin or mucous membranes.

Lotions, lotiones.—Solutions of drugs for external application (p. 845).

Collyria.—Lotions for eye bathing.

Collunaria.—Lotions for nasal douching.

Collutoria.—Lotions for mouth washing.

Gargles, gargarismata.—Drugs in solution for acting on the throat.

Enemata.—Liquid preparations for injection into the rectum (p. 60).

Injections, injectiones.—Drugs in solution for injecting hypodermically (p. 84), into the vagina (p. 73), rectum, etc.

Emulsions, emulsiones.—Mixtures containing ingredients of an oily or fatty nature which are suspended or rendered homogeneous by mucilage.

2. **Solid Preparations.**—*Extracts, extracta.*—Semi-solid and solid products obtained by evaporation.

Resins, resinae.—Substances soluble in alcohol but not in water.

Confections, confectiones.—Drugs incorporated with sugar, etc., to pasty consistency.

Capsules.—Thin envelopes of gelatine enclosing nauseous fluid or oily medicinal drugs.

Cachets.—Powdered drugs enclosed in wafer paper.

Pills, pilulae.—Soft solid masses, capable of being formed into small globules.

Powders, pulveres.—Finely powdered drugs.

Tablets, tablettae.—Compressed drugs.

Lozenges, trochisci.—Drugs incorporated with paste, gum, or sugar to be dissolved in the mouth.

Nebulae.—Drugs in solution to be used with a spray.

Lamellae.—Tiny discs of gelatine in which a drug is incorporated, used for the eye instead of drops.

Insufflations.—Powders for blowing into cavities.

Plasters, emplastra.—Medicinal substances mixed with lead or resin plaster, spread on coarse muslin or chamois leather, etc.

Poultices, cataplasmata.—Applications made with linseed meal as a basis, with or without the addition of drugs (see p. 91).

Bougies.—Solid cylinders impregnated with drugs to introduce into the nose, urethra, vagina, and rectum.

Pessaries, pessaria.—Drugs incorporated in broma oil, or cocoa butter, formed into conical shape for insertion into the vagina.

Suppositories, suppositoria.—Drugs incorporated in either theobroma oil or gelatine and formed into conical shape for introduction into the rectum.

Ointments, unguenta.—Drugs mixed with soft substances, as lard, paraffin wax, or oil.

THE CLASSIFICATION OF DRUGS

Drugs may be classed according to physiological action, or therapeutic action; the following are some of the most important.

Physical Classification:

Anaesthesia (Local).—(*a*) *External application.*—Cold, ethyl chloride spray, carbon dioxide snow (p. 739), carbolic acid, cocaine to mucous membranes (p. 440).

(*b*) *Subcutaneous injection.* — Cocaine, novocaine, benzamine (p. 440).

(*c*) *Spinal injection.*—Stovaine, novocaine (p. 441).

Anaesthetics.—Drugs which produce insensibility to pain either generally or locally.

(*a*) *Inhalation.* — Chloroform, ether, A.C.E. mixture, ethyl chloride, nitrous oxide gas (Chapter XIII).

(*b*) *Intravenous injection.*—Ether (p. 446).

(*c*) *Rectal injection.*—Ether (p. 447). Avertin, paraldehyde.

Analgesics.—See anodynes.

Anhidrotics diminish secretion of sweat. Atropine, cold.

Anodynes.—Drugs which relieve pain.

(*a*) *General anodynes.*—Belladonna, stramonium, all narcotics and some hypnotics.

(*b*) *Local anodynes.*—Menthol, aconite, carbolic acid, cocaine, opium liniments.

Anthelmintics.—Drugs which expel (vermifuge) or kill (vermicides) intestinal parasites.

(*a*) Tape worms (taenicides). Filix mas, turpentine, pelletierine (taken by mouth).

(*b*) Round worms. Santonin, senna (taken by mouth).

(*c*) Thread worms. Sodium chloride, quassia, alum, tannin (by enemata).

Antilithics.—Drugs which dissolve calculi.

Salts of potassium, lithium, and sodium (taken by mouth).

Antipyretics.—Agents which reduce fever.

(*a*) *External application.*—Cold water, ice (p. 90).

(*b*) *Internal administration.*—Salicylic acid, acetylsalicylic acid (aspirin), quinine, antipyrin, phenacetin, aconite, and alcohol.

Antiseptics.—Drugs which hinder or destroy the growth of micro-organisms.

(*a*) *Taken by mouth.*—Sulphonamide group (see varieties, p. 776), salol, betanaphthol, oil of turpentine, silver nitrate, croesote, iodine, quinine, naphthalin, hexamine, pyridium, pyridine.

(*b*) *By inhalation.*—Turpentine, creosote, eucalyptus, pinol, etc.

(*c*) *External application.*—Aniline dyes, carbolic acid, perchloride of mercury, biniodide of mercury, Lysol, cresol, hydrogen peroxide, quinine, iodine, picric acid, chlorine, etc. (For strengths of external antiseptic solutions, see table, p. 846.)

Antisialagogues decrease the flow of saliva. Atropine, opium, alkalis.

Antispasmodics.—Drugs which relieve spasms and spasmodic pains.

(*a*) *By inhalation.*—Ether, chloroform, amyl nitrite.

(*b*) *By mouth.*—Aromatic oils, bromides, valerian, asafoetida, alcohol, camphor, musk.

(*c*) *Hypodermic injection.*—Adrenalin, morphia.

Antizymotics.—Drugs which have the power of destroying disease germs.

(*a*) *External application.*—Carbolic acid, perchloride of mercury, chloride of lime, heat.

(*b*) *Fumigation.*—Formalin, sulphur.

Astringents.—Drugs which check secretions.

Mucous membranes.—Taken internally, by mouth, or rectum, or local application. Alum, acetic acid, tannic acid, sulphuric acid, salts of iron, lead, silver, zinc, copper, bismuth, opium.

Carminatives.—Drugs which are slightly stimulant, and expel gas from the stomach and intestines.

(*a*) *Taken by mouth.*—Peppermint, ginger, cinnamon, musk, camphor, capsicum, asafoetida, cardamom, cajuput, anise, caraway.

(*b*) *By rectum.*—Turpentine, rue, asafoetida (see enemata, p. 62).

Cathartics.—See purgatives.

Caustics.—Drugs which destroy living tissues.

External application.—Acids, carbolic, acetic (glacial), sulphuric, nitric; nitrate of silver, mercury, and copper; chloride of zinc, bromine.

Cholagogues.—Drugs increasing the flow of bile and acting on the liver.

By mouth.—Calomel, podophyllin, aloes, colocynth, rhubarb, colchicum, scammony, jalap, potassium sulphate, sodium phosphate.

Deodorants.—Substances which disguise or hide foul odours.

(*a*) *External applications.*—Most of the disinfectants (p. 843), eau de Cologne, scent.

(*b*) *Fumes.*—Tobacco, joss-stick.

Diaphoretics.—Drugs and agents which cause an increase in the cutaneous secretion (diaphoresis).

(*a*) *By mouth.*—Salicylates, Dover's powder, nitrous ether, ammonium, camphor, alcohol, antimony, antipyrin, aconite, opium.

(*b*) *Hypodermically.*—Pilocarpine.

(*c*) *Externally.*—Hot packs, hot-air baths (p. 112).

Disinfectants.—See antizymotics.

Diuretics.—Drugs which cause an increased secretion of urine (diuresis).

By mouth.—Water, pure, carbonated, and saline; potassium acetate, citrate, nitrate, and bitartrate; urea, digitalis, spirits of nitre, squill, convallaria, strophanthus, copaiba, cubeb, turpentine, alcohol, cantharides, salines, juniper, scoparium, tea, imperial drink (p. 820).

Intravenously, or by muscular injection.—Novurit, salygran.

Emetics.—Drugs and agents which cause vomiting.

(*a*) *By mouth.*—Warm water, salt water, alum, mustard and water, sulphate of zinc, sulphate of copper, carbonate of ammonia, ipecacuanha, antimony.

(*b*) *Hypodermically.*—Apomorphia.

(*c*) *Mechanical stimulation* of the fauces.

Enemata.—See Chapter III, p. 62.

Epispastics, or vesicants, produce blisters (p. 95).

External applications.—Cantharidin, cantharides, mustard.

Expectorants.—Drugs which increase bronchial secretion.

(*a*) *By mouth.* — Antimony, ipecacuanha, alkalis, ammonium carbonate and chloride, squill, balsam of Peru and of Tolu, terebene, senega, creosote, acids, syrups.

(*b*) *By inhalation.*—Benzoin, creosote, turpentine, eucalyptus, amyl nitrate, stramonium, conium, steam (see inhalations, p. 105).

Haematinics.—Drugs which can increase the amount of haemoglobin.

By mouth.—Iron and its salts, copper, arsenious acid.

Haemostatics.—Drugs or agents which check haemorrhage.

(*a*) *Local application.*—Adrenalin, tannic acid, gallic acid, turpentine, hamamelis; heat, cold, actual cautery, hydrogen peroxide.

(*b*) *By mouth.*—Calcium lactate, adrenalin, ergot.

(*c*) *By rectum.*—Calcium lactate.

(*d*) *Hypodermically.*—Ergotine.

Hypnotics.—Drugs which produce sleep without relieving pain.

(*a*) *By mouth.*—Bromides, chloral, amylene hydrate, paraldehyde, hyoscine, exalgine, trional, sulphonal, medinal, luminal.

(*b*) *Hypodermically.*—Hyoscine.

(*c*) *Per rectum.*—Bromide, chloral.

Mydriatics.—Drugs which dilate the pupil.

(*a*) *Local application.*—Atropine, cocaine, scopolamine (p. 638).

(*b*) *Internally.*—Alcohol, belladonna.

Myotics.—Drugs which contract the pupil.

(*a*) *Local application.*—Eserine (physostigmine, p. 637).

(*b*) *Internally.*—Opium.

Narcotics.—Drugs which relieve pain and have intensified hypnotic action.

(*a*) *By mouth.*—Opium, cannabis indica, bromal hydrate, soneryl.

(*b*) *Hypodermically.*—Morphia, heroin.

Parasiticides.—Drugs which destroy parasites on the skin.

Local applications.—Sulphur, ichthyol, mercurials, picrotoxin, ether, alcohol, carbolic acid, sassafras, chrysophanic and salicylic acids, formalin, stavesacre.

Purgatives.—Drugs which cause increased action of the bowel.

1. *Laxatives of moderate or gentle action.*—Olive oil, castor oil, glycerine, magnesia, manna, sulphur, figs, and prunes.

2. *Simple purgatives* produce active peristalsis. Aloes, senna, rhubarb, liquorice powder, cascara, castor oil.

3. *Drastic and hydragogue purgatives,* intense action, watery stools, much pain. Jalap, scammony, colocynth, gamboge, croton oil, elaterium, aloes.

4. *Saline purgatives.*—Watery evacuations but not drastic. Salts of magnesium, sodium, potassium; saline waters, Apenta, etc.

5. *Cholagogue purgatives* act on the gall-bladder and pancreas. Mercurial preparations, calomel, blue pill, grey powder, podophyllin. All mercurial preparations should be followed by a saline aperient.

Rubefacients.—Agents and drugs which cause reddening of the skin.

External applications.—Mustard, ammonia, capsicum, camphor, iodine, turpentine, arnica; heat, friction.

Specifics.—Drugs which have a direct curative effect on certain diseases, such as mercury in syphilis; salicylate of soda in rheumatism; quinine in malaria, etc.

Stimulants.—Drugs and agents which increase functional activity.

1. **General.**—(*a*) *By mouth.*—Alcohol, ether, ammonia, caffeine, tea, coffee, hot milk, beef-tea.

(*b*) *By rectum.*—Saline solution, brandy, black coffee (see rectal enemata, p. 60).

(*c*) *Intravenously.*—Saline solution, adrenalin (see intravenous infusion, p. 74).

(*d*) *Subcutaneously.*—Saline solution, adrenalin, suprarenal extract, strychnine. Pituitrin, coramine.

2. **Special.**—**Nervous System.**—(*a*) *By mouth.*—Strychnine, nux vomica, cannabis indica, nitro-glycerine.

(*b*) *Hypodermically.*—Strychnine.

3. **Circulatory System.**—(*a*) *By mouth.*—Digitalis.

(*b*) *Hypodermically.*—Digitalin, oil of camphor.

(*c*) *Local application.*—Heat, moist or dry, electricity, liniments containing camphor, ammonia, chloroform, iodine, turpentine, mustard, and croton oil.

(*d*) *Wounds.*—Red lotion, zinc, peruvian balsam.

Stomachics.—Drugs which increase the functional activity of the stomach.

1. *Stomachic tonics.*—Vegetable bitters, e.g. calumba, gentian, chiretta, quassia, cascarilla, strychnine; mineral acids, nitric, hydrochloric acid; pepsin.

2. *Stomachic sedatives.*—Alkaline salts, e.g. salts of soda and potash; salts of bismuth; salts of silver, e.g. oxide and nitrate of silver; acid hydrocyanic dil.; belladonna, hyoscyamus, stramonium, opium; oxalate of cerium.

Styptics.—See haemostatics.

Tonics.—Drugs which promote nutrition and give tone to the system.

By mouth.—Strychnine, nux vomica, gentian, quinine, iron, arsenic, phosphates, hypophosphites, cod-liver oil, malt; acids, hydrochloric, nitro-hydrochloric, phosphoric, lactic, citric.

CHAPTER XXVI

POISONS, ANTIDOTES, AND ANTAGONISTS

POISONS are grouped into three classes: Functional poisons, corrosives, and irritants. (Dangerous Drugs Act, see p. 847.)

1. **Functional Poisons** are those which act upon the function of organs or systems, and include many drugs given as medicines, or used as lotions, etc. The process is gradual as a rule; treatment is given according to the drug which causes the poisoning and the symptoms present (p. 771).

2. **Corrosives** are those which act rapidly, causing erosion on contact with the tissues; these comprise acids, alkalis, corrosive salts, and gases. Death is usually sudden; if not immediate, administer the antidote, lavage is not given unless ordered, and an emetic may cause further injury.

3. **Irritants.**—Those which irritate the tissues on contact with them; these include metals, ether, alcohol, some salts, turpentine, phosphorus, iodine, and cantharides. The stomach is emptied immediately by emetics or lavage; the antidote is given; external heat is applied; stimulants are given hypodermically or by rectum; the recumbent position must be maintained with the head low, the foot of the bed being raised on blocks if necessary. Castor oil is often ordered, also morphia for the relief of pain.

Antidotes.—Antidotes are substances which act upon the toxins in the alimentary canal and prevent their toxic action. Immediate treatment consists in the administration of the antidote.

Antagonists.—Substances which counteract the effect of the poison on the system and are used after antidotes, and constitute the after-treatment.

Emetics.—When an emetic is ordered, one of the following may be employed, unless a special emetic is mentioned:

(*a*) *Mustard and water.*—A tablespoonful of mustard stirred up in two-thirds of a tumbler of lukewarm water.

(*b*) *Ipecacuanha wine.*—Fifteen to twenty grains given every quarter of an hour until vomiting occurs; it may be followed by large drinks of warm water, which hasten the effect.

(*c*) *Sulphate of copper.*—Five grains dissolved in half a tumbler of warm water.

(*d*) *Sulphate of zinc.*—Thirty grains dissolved in half a tumbler of lukewarm water.

(*e*) *Apomorphine*, given hypodermically, $\frac{1}{10}$–$\frac{1}{6}$ gr.; the swiftest emetic (p. 844).

(*f*) *Soap-suds, salt.*—Either of these in small amount given in tepid water will cause vomiting.

(*g*) *Warm water* given copiously, alone or after one of the above.

(*h*) *Mechanical stimulation* of the fauces, with a finger or feather.

Demulcent Drinks.—When demulcent drinks are ordered, one or more of the following may be given: Linseed tea, barley water, milk, white of egg, albumin water, for the preparation of which see Chapter XXVIII.

Stimulants.—Hot strong coffee, tea, smelling salts. Sal volatile, 1 or 2 drachms in 1 or 2 ounces of water. Brandy or whisky by mouth, by rectum, or hypodermically. Ether, 30–60 minims, hypodermically.

FUNCTIONAL POISONS

List of Drugs used as Medicines, Lotions, etc., in which Symptoms of Intolerance or Commencing Poisoning may occur.—The nurse should ascertain from the physician or surgeon for whom she is working what his wishes are as regards continuing the drug in the event of any of the following symptoms occurring. The drug is usually withheld for a time, but the nurse should not discontinue the medicine without orders from the physician except in the event of an urgent and serious complication occurring. The nurse must report to the physician immediately and ascertain his wishes as regards the drug before the next dose becomes due, if in any way possible. Should symptoms of poisoning occur when a lotion is in use, the nurse must report immediately to the surgeon and substitute normal saline solution for the lotion until she receives other instructions. In the following table a list of the commoner symptoms will be found together with the treatment frequently prescribed.

Aconite.—*Dose.*—Tincture of aconite, 1–4 minims.

Symptoms of intolerance.—Pulse small, soft, and slow; respiration slow, deep, and sighing; temperature subnormal; vertigo, weakness; sensation of tingling of the mouth and skin generally.

Treatment.—Recumbent position, no sudden movements; avoidance of cold and draughts, stimulants.

Caution.—Before giving a dose of aconite the patient's pulse should always be taken; watch temperature and respiration carefully.

Antimony.—*Dose.*—Tartar emetic, $\frac{1}{24}$–$\frac{1}{8}$ gr.; wine of antimony, 10–30 minims.

Intolerance.—Pulse weak, soft, and compressible, slow and irregular; respiration is weakened, inspiration shortened, expiration lengthened; profuse perspiration; muscular relaxation and general depression; vomiting.

Treatment.—Recumbent position with the head low; stimulants.

Antipyrin (Phenazone).—*Dose.*—5–15 grains.

Intolerance.—Pulse feeble and irregular; respiration rapid, cyanosis; collapse, and marked depression.

Treatment.—Recumbent position. Treatment for collapse (see p. 562); stimulants, heat, stimulating enemata (see p. 60).

Arsenic.—*Dose.*—Fowler's solution, 1–10 minims; arsenious acid, $\frac{1}{60}$–$\frac{1}{15}$ gr.; arsenious iodide, $\frac{1}{20}$–$\frac{1}{5}$ gr.

Intolerance.—Puffiness and itching of the eyelids; tingling and itching of the fingers; abdominal pain and soreness; later, metallic taste, nausea, vomiting, diarrhoea; palpitations; dyspnoea; weak and irregular pulse. Chronic form, anaemia, gastric disturbance, debility, neuritis.

Treatment.—Aperients, castor oil, good food.

Belladonna.—*Dose.*—Tinct. belladonna, 10–30 minims; atropine sulph., $\frac{1}{200}$–$\frac{1}{75}$ gr. Atropine and its derivative homatropine used as a mydriatic.

Intolerance.—Dryness of the nose and throat; thirst; rash; pulse full and rapid; rise of temperature; excitement, later delirium.

Treatment.—Give water to drink freely. Cold packs or sponging (p. 110). Bromide or other sedatives may be prescribed by the physician.

Bromides.—*Dose.*—Potassium bromide, 5–30 gr.; ammonium bromide, and sodium bromide, the same dose (cumulative drug, p. 759).

Intolerance (*bromism*).—Salt taste in the mouth, foetid breath, salivation; mental and physical inertia, apathy, dullness; acne rash.

Treatment.—Aperients.

Caution.—When giving bromide careful attention to the digestion and the regulation of the bowels is necessary to prevent bromism.

Carbolic Acid (Phenol).—*Dose.*—1–3 minims well diluted. Carbolic may also be absorbed when used for spraying or painting the throat, for dressing wounds, etc.

Intolerance.—Giddiness; dark greeny-black urine (carboluria); later, a small feeble pulse; embarrassed breathing; contracted pupils; pallor; sudden vertigo, and ringing in the ears (tinnitus); collapse.

Treatment.—Stimulants, hot bottles, and treatment for collapse (p. 562). Recumbent position.

Chloral.—*Dose.*—Chloral hydrate, 10–20 gr.; chloralamide, 15–30 gr. Sulphonal, gr.; x–xxx.

Intolerance.—Sleep, syncope, cyanosis, irregular pulse. Chloral may cause paralysis of the heart without any warning; the patient may be sleeping quietly, but suddenly becomes restless and passes into a state of syncope. A rash is sometimes caused, also redness and swelling of the conjunctiva.

Treatment.—Fresh air, rousing, stimulants, heat, and friction of the extremities.

Caution.—A patient having had chloral requires careful watching during sleep.

Cocaine.—*Dose.*—Taken internally $\frac{1}{5}$–$\frac{1}{2}$ gr.; used as a local anaesthetic in strengths 2, 4, 5 per cent.

Intolerance.—Pulse small, rapid, and intermittent; oppressed breathing, respiration slow and shallow; cold clammy skin, pallor; dilated pupils; there are sometimes convulsions, hallucinations, and delirium.

Treatment.—Recumbent position, external heat, alcoholic stimulants, coffee enema, amyl nitrate inhalations, artificial respiration; morphia given hypodermically is an antidote.

Colchicum.—*Dose.*—Tincture, ♏v–xv; wine, ♏x–xxx; extract, $\frac{1}{4}$–1 gr.

Intolerance.—Dizziness, fullness, and pain in the head; sneezing, running of the eyes; irritated fauces; coated tongue, nausea, and vomiting; loss of appetite; abdominal discomfort or pain; flatulence; tenesmus; bodily pains, either pricking, tingling, or smarting sensations. Later, persistent vomiting and purging attended with griping pain; passage of blood and mucus in the stools; urine may be diminished or suppressed, or much increased; spasms and convulsions.

Treatment.—Stimulants are given if needful; warmth is very necessary, also treatment for collapse if present (p. 562); recumbent position. The gastric and intestinal disturbance is treated by dieting, starch and opium enemata (p. 60) may be ordered.

Digitalis.—*Dose.*—Tincture of digitalis, 5–20 minims; infusion, 1–4 drachms; digitalin, $\frac{1}{50}$ gr. given hypodermically (cumulative drug), tablets of digitalis folia, $\frac{1}{240}$ gr. Proprietary preparations include Nativelle's Digitalein, gr. $\frac{1}{240}$; Digoxin, 0·25 mg. b.d. (in urgent heart failure the dose may be increased to 1·5 mg. by mouth or 1 mg. intravenously).

Intolerance.—Pulse slow, full, and intermittent, becoming rapid on exertion; diminished quantity of urine; headache, nausea, vomiting; disturbances of vision.

Treatment.—Recumbent position, tea, coffee, alcoholic stimulants, strychnine may be prescribed.

Caution.—Patients taking digitalis should have the pulse counted before each dose; the urine should be measured; and no sudden exertion should be allowed.

Ergot.—*Dose.*—Liquid extract, ♏x-xxx; extract, gr. ij–viij. Hypodermic injection of ergot or ergotine, 5–10 minims.

Intolerance.—Tickling in the throat; unpleasant taste in the mouth; burning pain in the abdomen or stomach with eructations of gas, diarrhoea; irregular pulse; headache; general malaise, feeling of chilliness; lassitude; specks before the eyes; unsteady gait; diminished quantity of urine passed.

Treatment.—Recumbent position, warmth.

Insulin, Iletin.—*Dose.*—5–20 units injected hypodermically (p. 83).

Intolerance.—Hypoglycaemia (p. 291), dizziness, sweating, tremor, muscular weakness, convulsions, delirium, coma.

Treatment.—½ oz. of sugar in water by mouth, or glucose by the rectum or intravenously (p. 292).

Iodides of Potassium and Sodium.—*Dose.*—5–20 gr. well diluted; tinct. iod., 2–5 minims.

Intolerance (iodism).—Catarrh of the eyes, nose, throat, or bronchial passages; frontal headache, sore throat, hoarseness, salivation and difficulty in swallowing; rise in temperature, skin eruptions; anorexia and debility.

Treatment.—Mouth wash and chlorate of potash gargle; digestive disturbances are treated with diet and purgatives.

Iodoform.—*An iodine preparation used externally.*

Intolerance.—Rise of temperature to 104° F. or higher; headache, rapid compressible pulse, anorexia. Iodine is present in the urine.

Treatment.—The iodoform dressing is discontinued.

Mercury.—*Dose.*—Calomel, ¼–5 gr.; blue pill, 3–5 gr.; grey powder, 2–5 gr.; liquor hydrarg. perchlor., $\frac{1}{32}$–$\frac{1}{16}$ gr. External applications: corrosive sublimate (perchloride of mercury) (1–1000—1–5000); various ointment preparations are also used, also black wash. Ung. hydrarg. used for inunction.

Intolerance.—Salivation, tender gums, metallic taste, loose teeth, blue line on gums; gastric disturbances, ulceration of mouth; anaemia; nephritis.

Treatment.—Frequent mouth washes. Diet, milk only if nephritis is present. Warmth, avoidance of chills.

Opium.—*Dose.*—Tincture of opium, 20–30 minims; tinct. camphorae co. ½–1 fl. drachm; Dover's powder, 5–10 gr.; hypodermic injection of morphia (5 per cent solution), 2–5 minims, or $\frac{1}{12}$–¼ gr.

Intolerance.—Deep sleep, slow respiration (to 12 or less per minute); contracted pupils; clammy sweat; cyanosis.

Treatment.—Rouse the patient and keep awake by constant movement if the respiration is very slow, otherwise if pulse and respiration are fairly good the patient is allowed to sleep off the effects.

Caution.—The respiration must be frequently noted in patients having morphia.

Phosphorus.—*Dose.*—Dilute phosphoric acid, 10–20 minims; syrup of hypophosphites, 1–2 drachms.

Intolerance. — Gastric disturbances with eructations of gas; depression of the heart. Perspiration and urine are increased, the latter becomes reddish in colour and has the odour of violets.

Treatment.—Stimulants, warmth, recumbent position.

Quinine.—*Dose.*—Quinine sulphate, quin. hydrochloride, 1–10 grains. Externally: used as a collyrium.

Intolerance (*cinchonism*).—Ringing in the ears, deafness; urticaria or other skin eruptions; sometimes causes kidney complication, also syncope and prostration.

Treatment.—Recumbent position, fresh air, stimulants.

Salicylate of Soda, salicylic acid, salicin.—*Dose*, 5–20 grains.

Intolerance (*salicylism*).—Noises in the ears, deafness; headache; depression; physical weakness; later nausea, vomiting; weak and irregular pulse; slow laboured respiration (air-hunger); restlessness, delirium; albuminuria; haemorrhages; an erythematous rash; the urine may be dark olive green; incontinence of faeces may be present; in the worst cases, bedsores are liable to form.

Treatment.—Stimulants, recumbent position, warmth.

Santonin.—*Dose.*—2–5 grains.

Intolerance.—Slow pulse; feeble respiration; objects may appear blue at first, then yellow; tremors; aphasia; sometimes convulsions. Urine may be orange colour.

Treatment.—Recumbent position, warmth, stimulants.

Silver Nitrate.—*Dose.*—Gr. ¼–½ in pill. External application, silver stick; also in solution, 5–20 grains. Used also on mucous surfaces such as conjunctiva, colon, etc.

Intolerance.—Gastric disturbances; wasting; rapid and irregular pulse; disturbed respiration; albuminuria; convulsions; loss of co-ordination; paralysis. Bluish discoloration of subcutaneous tissues (rare).

Treatment.—Recumbent position, warmth.

Stramonium, Daturin.—*Dose.*—Extract, ¼–1 grain; tincture, 5–15 minims.

Intolerance.—Dilated pupils; pyrexia; scarlet rash; restlessness; delirium and convulsions; irregular pulse; later, stupor, paralysis, and asphyxia.

Treatment.—See belladonna, p. 772.

Strychnine.—*Dose.*—Tinct. nux vomica, 5-20 minims; strych. hydrochloride given by mouth or hypodermically (cumulative).

Intolerance.—Restlessness; slight trembling of the extremities; muscular twitchings and jerking; sense of stricture about the throat and chest; shuddering; feeling of anxiety; excitement; over-stimulation of the special senses, especially hearing; cardiac disturbance.

Treatment.—Rest in bed; bromides may be prescribed.

The Sulphonamide Drugs.—The effect of all these compounds is to inhibit the growth of bacteria, thus allowing the body's defences to overcome infection. Each compound combats certain bacteria more readily than others, thus:

Sulphanilamide (Prontosil, album, or streptoccide) acts on haemolytic streptococci and on B. coli group, therefore is used in erysipelas, B. coli urinary infections, and scarlet fever.

Sulphapyridine (M & B 693) acts on the pneumococcus, meningococcus, gonococcus, and B. Welchii, therefore its use is indicated in pneumococcal pneumonia, cerebrospinal fever, gonorrhoea, and gas gangrene.

Sulphathiazole (M & B 760) acts on Staphylococcus aureus, Streptococcus faecalis, also on the pneumococcus and meningococcus; it is used in urinary infections, osteomyelitis, meningococcal infections, pneumonia, and puerperal sepsis (p. 712).

Sulphonamides are sometimes given to prevent infection and are used in this way in the treatment of wounds, when the drug may be incorporated in the wound at the time of the operation, may be used as a dusting powder, or in the form of a paste.

Sulphonamides are usually given by mouth; the dosage varies with the infection being treated, and may be regulated by estimation of the blood concentration of the drug. The drug is put up in ½ (half) gramme tablets. In pneumonia 2 grammes (4 tablets) are given, followed by 1 gramme at hourly intervals for as long as necessary.

When oral administration causes vomiting sulphonamides may be given by intramuscular or intravenous injection of a solution of the drug.

Intolerance.—(*a*) Renal symptoms due to crystallization of the drug in the tubules of the kidney.

(*b*) Dizziness and mental confusion.

(*c*) Headache.

(*d*) Cyanosis associated with disturbance of the oxygen-carrying power of the haemoglobin—sulphaemoglobinaemia or melhaemoglobinaemia may occur.

(*e*) Agranulocytosis, a serious condition, where there is decrease or absence of polymorphonuclear leucocytes from the blood and bone marrow; signs of which are rise of temperature, ulceration of the mouth and throat, and increase of general malaise.

To avoid these complications patients while taking this drug should receive at least 3 pints of fluid per day, and alkalis are ordered in sufficient quantities to keep the urine alkaline. This precaution is necessary as sulphonamides in an acid urine tend to crystallize, and may cause haematuria, or block the kidney tubules, or give rise to the formation of renal stones, whereas in alkaline urine they remain in solution.

If agranulocytosis occurs the drug should be discontinued and blood transfusion may be given.

In all cases where sulphonamides are prescribed an accurate chart should be kept showing times and methods of administration and the dosage used.

Penicillin. See Chemotherapy, p. 839.

CORROSIVE AND IRRITANT POISONS ARRANGED ALPHABETICALLY

Aconite.—*Antidote—Immediate treatment.*—Emetic; stomach lavage; atropine sulphate by mouth or hypodermically.

Antagonistic treatment.—Recumbent position; artificial respiration (p. 549); external heat; stimulants hypodermically, especially atropine; saline infusion (p. 58); ammonia; no exertion allowed.

Alcohol.—*Antidote—Immediate treatment.*—Emetic, lavage.

Antagonistic treatment.—Cold to the head; heat to the extremities; inhalations of ammonia; black coffee by mouth or rectum; electricity; aperients.

Almonds.—Essential oil of bitter (see hydrocyanic acid, p. 780).

Ammonia. See caustic potash.

Antimony, Salt of.—*Antidote—Immediate treatment.*—Emetic if necessary; lavage with tannic acid; tea.

Antagonistic treatment.—Opium; stimulants; demulcent drinks; warmth.

Arsenic.—Arsenious acid, Fowler's solution, Paris green, rat poison.

Antidote—Immediate treatment.—Emetic or lavage; dialysed iron, or ferric hydrate, repeat frequently, with lavage subsequently.

Antagonistic treatment.—Recumbent position, stimulants hypodermically; external heat; hot applications to the abdomen; opium; castor oil; demulcent drinks; enema opii (p. 60) for tenesmus.

Atropine.—Belladonna, stramonium.

Antidote—Immediate treatment.—Emetic; lavage with strong tea or tannic acid. Hypodermic injections of pilocarpine nitrate.

Antagonistic treatment.—Recumbent position; warmth; brandy; coffee.

Battle's Vermin Killer. See strychnine, p. 781.

Battley's Solution. See opium, p. 780.

Belladonna. See atropine, above.

Benzol.—*Antidote—Immediate treatment.*—Emetic, lavage.

Antagonistic treatment.—Recumbent position; warmth; brandy; inhalations of ammonia; hypodermic injection of atropine sulph.

Bichromate of Potash.—*Antidote—Immediate treatment.*—Lavage; chalk in milk.

Antagonistic treatment.—Demulcents; olive oil; warmth; opium and stimulants may be necessary.

Butler's Vermin Killer. See strychnine, p. 781.

Calabar Bean.—*Antidote—Immediate treatment.*—Emetic, or lavage.

Antagonistic treatment.—Recumbent position, warmth. Sal volatile; repeated injection of atropine sulph. or tincture of belladonna (♏xxv) by mouth or rectum; brandy.

Camphor.—*Antidote—Immediate treatment.*—Emetic, lavage.

Antagonistic treatment.—Inhalation of sal volatile. Subcutaneous injection of brandy. Fomentations (p. 90).

Cantharides.—*Antidote—Immediate treatment.*—Lavage, or emetic.

Antagonistic treatment.—Demulcents; opium; morphine.

Carbolic Acid.—*Antidote—Immediate treatment.*—Lavage with sulphate of magnesium or sodium. Alcohol by mouth or by stomach tube.

Antagonistic treatment.—Recumbent position, warmth. Olive oil; demulcent drinks. Brandy subcutaneously or by rectum. Saline infusion (p. 58).

Caustic Potash.—**Caustic Soda.**—*Antidote—Immediate treatment.*—Dilute acid by mouth or stomach tube, either vinegar, lemon, or orange juice, or other vegetable acid.

Antagonistic treatment.—Recumbent position, external heat; demulcents; olive oil; opium; brandy subcutaneously.

Chloral Hydrate.—*Antidote—Immediate treatment.*—Lavage with tea or coffee.

Antagonistic treatment.—Fresh air; external warmth, cold wet towel to face, head, and neck; hot strong coffee. Artificial respiration (p. 549); stimulants hypodermically or by rectum; inhalations of oxygen, carbon dioxide (p. 107), and amyl nitrite. Faradic current. No exertion allowed; recumbent position with head low. Prevent the patient sleeping.

Chlorodyne. See opium, p. 780.

Chloroform inhaled. See p. 456.

Chloroform swallowed.

Antidote—Immediate treatment.—Emetic, lavage.

Antagonistic treatment.—Cold water to face and chest. Artificial respiration (p. 549); oxygen. Nitrite of amyl. Olive oil.

Cocaine.—*Antidote—Immediate treatment.*—Brandy, nitrite of amyl. Subcutaneous injection of ether. Ammonia to nostrils.

Antagonistic treatment.—Recumbent position. Warmth, bromide, chloroform for convulsions.

Cocculus Indicus. See picrotoxin, p. 781.

Colchicum.—*Antidote—Immediate treatment.*—Emetic, lavage.

Antagonistic treatment.—Strong tea. Tannic acid. Demulcents. Stimulants. Recumbent position. Warmth. Artificial respiration (p. 549).

Conium.—*Antidote—Immediate treatment.*—Emetic, lavage with tannic acid.

Antagonistic treatment.—Recumbent position, warmth. Strychnine hypodermically. Stimulants. Artificial respiration (p. 549).

Copper, Salts of.—*Antidote—Immediate treatment.*—White of egg and warm water, followed by lavage if vomiting has not occurred.

Antagonistic treatment.—Demulcents. Morphine and laudanum if in much pain. Fomentations (p. 90).

Corrosive Sublimate. See mercury, p. 780.

Cyanide of Potassium. See hydrocyanic acid, p. 780.

Dalby's Carminative. See opium, p. 780.

Deadly Nightshade. See belladonna, p. 778.

Digitalis.—*Antidote—Immediate treatment.*—Emetic, followed by lavage with tannic acid or tea.

Antagonistic treatment.—Recumbent position, no exertion long after urgent symptoms have subsided. Stimulants, strong tea or coffee. Aperients.

Emerald Green. See arsenic, p. 777.

Ergot.—*Antidote—Immediate treatment.*—Emetic and lavage. Amyl nitrite.

Antagonistic treatment.—Brandy, sal volatile, strong tea, aperient.

Eserine. See Calabar bean, p. 778.

Ether. See p. 455.

Fungi.—*Antidote—Immediate treatment.*—Emetic. Sal volatile.

Antagonistic treatment.—Injection of atropine sulph. (p. 842) or tinct. belladonna ♏xx by mouth. Stimulants. Warmth. Recumbent position.

Gibson's Vermin Killer. See strychnine, p. 781.

Godfrey's Cordial. See opium, p. 780.

Henbane (Hyoscyamus). See belladonna, p. 778.

Hydrochloric Acid (Spirits of Salts).—*Antidote—Immediate treatment.* Alkalis, soda, magnesia, chalk, lime water, whitewash, soapy water; followed by demulcents, oil, egg albumin, milk by mouth or by stomach tube if unconscious.

Antagonistic treatment.—Demulcents. Recumbent position, external heat. Fresh air. Morphia. Stimulants.

Hydrocyanic Acid.—*Antidote—Immediate treatment.*—Emetic, alkaline lavage.

Antagonistic treatment.—Artificial respiration (p. 549). Alternate hot and cold water to face and spine. Inhalation of ammonia. External heat. Brandy by mouth or by rectum. Faradic current. Hypodermic injection of atropine sulph.

Iodine.—*Antidote—Immediate treatment.*—Emetic and lavage.

Antagonistic treatment.—Starch and water. Demulcents. Nitrite of amyl, morphine. Fomentations (p. 90). External warmth.

Lead, Salts of.—Acute.

Antidote—Immediate treatment.—Emetic, lavage. Sulphate of magnesia.

Antagonistic treatment.—White of egg. Demulcents. Aperients. Opium.

Mercury, Salts of.—*Antidote—Immediate treatment.*—White of egg or milk, followed immediately by emetic or lavage.

Antagonistic treatment.—Lavage frequently after antidote. Castor oil. Demulcents. Opium. Stimulants. External warmth. Milk until after the urine is normal.

Morphine. See opium.

Mushroom. — *Antidote* — *Immediate treatment.* — Emetic, lavage with tannic acid.

Antagonistic treatment.—Castor oil. Stimulants. Hypodermic injection of atropine sulph. Stimulant enemata. Saline infusion (p. 58).

Nicotine.—*Antidote—Immediate treatment.*—Emetic, lavage.

Antagonistic treatment.—Stimulants. External warmth. Recumbent position. Artificial respiration (p. 549). Hypodermic injection of strychnine.

Nitrate of Silver.—*Antidote—Immediate treatment.*—Common salt in milk or water. Emetic.

Antagonistic treatment.—Demulcents.

Nitric Acid. See hydrochloric acid, above.

Nitro-glycerine.—*Antidote—Immediate treatment.*—Cold affusions.

Antagonistic treatment.—Recumbent position. Hypodermic injections of either ergotine or atropine sulph.

Opium.—Laudanum, paregoric, morphia, heroin, codeine.

Antidote—Immediate treatment.—Lavage every half-hour with permanganate of potash. Ammonia to the nostrils.

Antagonistic treatment.—Rouse the patient, dash cold water on face. Ammonia or amyl nitrite to nostrils. Hot strong coffee. Stimulants hypodermically or by rectum. Artificial respiration (p. 549). Faradic current, oxygen. Empty the bladder by catheter (p. 66) to prevent reabsorption of the drug.

Oxalic Acid.—*Antidote—Immediate treatment.*—Chalk, or whitening and water. Lime water one pint, or saccharated lime water.

Antagonistic treatment.—Stimulants. Castor oil. Warmth.

Phosphorus.—*Antidote—Immediate treatment.*—Emetic, lavage, French oil of turpentine or Sanitas ℥ſs in mucilage every half-hour. Sulphate of magnesia.

Antagonistic treatment.—Avoid oil and fats. Opium. Warmth.

Picrotoxin.—*Antidote—Immediate treatment.*—Emetic, lavage, chloral.

Antagonistic treatment.—Quiet. Bromide and chloral.

Pilocarpin. See Calabar bean, p. 778.

Potash Caustic. See caustic potash, p. 778.

Rat-pastes.—As for phosphorus or arsenic, p. 777.

Salts of Lemon. See oxalic acid.

Santonin.—*Antidote—Immediate treatment.*—Emetic; lavage.

Antagonistic treatment.—Stimulants. Bromide and chloral for convulsions.

Savin.—*Antidote—Immediate treatment.*—Emetic.

Antagonistic treatment.—Demulcents. Castor oil. Opium or morphine.

Sewer Gas.—Fresh air. Artificial respiration. Coffee by mouth or rectum. External warmth. Faradism. (See also p. 548.)

Sorrel, Salts of. See oxalic acid.

Stramonium. See belladonna, p. 778.

Strychnine (Nux vomica).—*Antidote—Immediate treatment.*—Lavage with tannic acid, or every half-hour with permanganate of potash. Bromide of potassium by rectum.

Antagonistic treatment.—Absolute quiet. Bromide and chloral by mouth or by rectum. Chloroform for convulsions. Opium. Artificial respiration, p. 549.

Sulphonal. See chloral hydrate, p. 778.

Sulphuric Acid. See hydrochloric acid, p. 780.

Tartar Emetic. See antimony, p. 777.

Tin, Salts of.—*Antidote—Immediate treatment.*—Emetic. Lavage. Egg albumin. Milk.

Antagonistic treatment.—Demulcents.

Turpentine.—*Antidote—Immediate treatment.*—Emetic. Lavage.

Antagonistic treatment.—Demulcents. Sulphate of magnesium. Morphine.

Veronal. See chloral hydrate, p. 778.

Vitriol, Blue. See copper, p. 779.

Vitriol, White. See zinc, below.

White Precipitate. See mercury, p. 780.

Yew. See digitalis, p. 779.

Zinc, Salts of.—*Antidote—Immediate treatment.*—White of egg. Carbonate of sodium in dilute solution. Soapy water. Do not check vomiting.

Antagonistic treatment.—Demulcents. Strong tea. Fomentations (p. 90). Morphine. External warmth.

(For Dangerous Drugs and Poisons Act, see Appendix, p. 847.)

CHAPTER XXVII

DIETETICS

CONSTITUENTS OF FOOD

Water.—Water forms about two-thirds of the body tissues: it is the great solvent, and is essential for all chemical changes taking place in the body: it regulates temperature, dilutes toxins, and is, next to air, the most necessary principle of life. It is obtained by the body as drink, in solid food, and as a product of metabolism. It is given off from the body by the lungs, skin, and kidneys; it is estimated that to make good this loss, an average amount of two and a half pints should be *drunk* daily, in addition to that taken in foods.

Food.—The elements of food are proteins, carbohydrates, fats, mineral salts, vitamins, water, extractives, and flavouring materials (see Food Tables, p. 805).

Food is necessary (1) to provide material for growth and repair of tissues—protein; (2) to maintain the body heat and produce energy—carbohydrates and fats; (3) to regulate growth and for energy production (regulating and protective foods)—vitamins and mineral matter.

(1) **Proteins** (p. 810) are used in the body mainly for growth and repair of tissues, but also may, to a limited extent, serve as a source of energy. All proteins are built of amino-acids. Proteins which contain good quantities of the essential amino-acids are termed *first-class* proteins, e.g. milk and its derivatives, eggs, meat, and fish. Certain forms of protein, e.g. *gelatine*, are obtained from cartilage and bone by prolonged boiling: these supply energy, but although containing nitrogen take no part in tissue formation: they are sometimes called ' protein spares.'

(2) **Carbohydrates** (p. 805) are essential as a source of energy and for the metabolism of fats. They also act as ' protein spares.' Taken in excess they are stored in the body as fat.

(3) **Fats** (p. 813) are animal and vegetable in origin and are the most valuable fuel foods.

Mineral Salts (protective food). Calcium in the circulating fluid is necessary for the beating of the heart, the clotting of blood, the process of osmosis (p. 305), and the growth of bones and teeth. It is present in milk, eggs, cheese, green vegetables, and whole grain. Its deficiency is associated with certain diseases, e.g. tetany (p. 300), chilblains, etc. Phosphorus is a constituent of all cells, especially the nuclei, and occurs in bone combined with calcium; it is also essential for the functioning of the endocrine glands (p. 287). It is contained in cheese, egg yolk, cereals, fruit, milk, bran, and oatmeal.

Iodine is a constituent of thyroxin and its deficiency is associated with goitre (p. 297). Iodine is present in *sea* foods, fish, shell-fish, leafy vegetables, watercress, onions, water.

Manganese is required in the metabolism of the ductless glands; it is present in most foods, notably liver, pancreas, and kidneys.

Organic Salts are formed of vegetable acids, e.g. citric acid in lemons and oranges, malic acid in apples and other fruits, tartaric acid in grapes. These when burnt in the body are converted into *carbonate* and tend to preserve the *alkalinity* of the blood.

Vitamins, sometimes referred to as accessory food factors, are chemical substances of various types which play an important role in the physiological functions of the body. Most of them have been identified chemically, and many have been synthesized and produced on a large scale.

When first discovered through dietary experiments on animals and humans it was the custom to label them with various letters of the alphabet to distinguish them, but as their chemical constitution has been worked out it is now more usual to refer to them by their chemical titles, a method which avoids confusion.

Vitamins are widely distributed in plant and animal tissues, most foodstuffs containing one or more of them, but none contains them all, and few are rich in them. Only small amounts of vitamins are needed to maintain bodily health, but the old idea that they behaved as catalysts and their presence, in however small a quantity, was satisfactory, is now known to be incorrect. A definite daily intake is required depending on the body weight, the caloric intake, and the metabolic rate of the individual, and although the daily amount needed is in some instances quite small, in others it is comparatively large. Most of them appear to affect growth and a severe deficiency leads to a specific deficiency disease, whilst a total absence will ultimately end in death. A good mixed diet with adequate amounts of the protective foods will prevent deficiency diseases, and the dictum 'Take care of the calories and the vitamins will take care of themselves' generally holds good. In ill health and with restricted diets special provision for the necessary vitamin intake is required, and for the treatment of deficiency disease natural vitamin concentrates or synthetic vitamins are preferable. When large amounts are needed, or it is necessary to administer them by hypodermic injection, the latter possess special advantages.

Before the identity of the various vitamins was discovered it was

THE KNOWN VITAMINS 1939—OIL-SOLUBLE. Adapted from a table supplied by THE CROOKES LABORATORIES

Vitamin	*A*	*D_2 (Calciferol)*	*D_3 (Natural)*	*E ($\alpha\beta\gamma$-Tocopherols)*	*K (α-Phylloquinone)*
Molecular Formula	$C_2H_{30}O$	$C_{28}H_{44}O$	$C_{27}H_{46}O$	$C_{29}H_{50}O_2$	$C_{32}H_{48}O_2$ K_4 2-Methylnaptho-quinone $C_{11}H_8O_2$
Method of Assay { Biological Chemical Physical	Growth (young rats) Blue test ($SbCL_3$) Ultra-violet absorption	Cure of rickets in young rats	Cure of rickets in young rats and chickens	Restoration of fertility (rats) Reducing power (Fe)	Restoration of blood-clotting (deficient chick)
Has been synthesized	Yes (?)	No	No	Yes	Yes K_4 Yes
Average daily requirements of a young child	6,000 to 8,000 I.U. (2·5 mg.)	2,000 I.U. (0·05 mg.)	2,000 I.U. (0·05 mg.)		20,000 (?) (1 mg.)
Average daily requirements of an adult	4,000 I.U.	500 I.U.	500 I.U.	?	50,000 (?)
Deficiency disease	Xerophthalmia Toad skin Night blindness	Rickets	Rickets	Loss of fertility	Loss of blood-clotting power
The best food sources	*Int. units per gm.* Milk 3·5 Butter 20–50 Egg yolk 50 Spinach 50 Carrots * 19 Runner beans * 6 Cabbage * 9 * Fresh or boiled		*Int. units per gm.* Milk 0–0·1 Butter 0·4–4·0 Cream 0·5 Egg yolk 1·5–5·0 Calf liver 0 Olive oil 0	*γ per gm.* Wheat germ 170 γ Lettuce +	*Units per gm.* Green leaves Alfalfa 200–400 Cabbage 400 Spinach 550 Strawberry 15 Tomato, ripe 50 Soya bean 25 Wheat germ, less than 5 Potatoes 10

THE KNOWN VITAMINS 1939—WATER-SOLUBLE. Adapted from a table supplied by THE CROOKES LABORATORIES

Vitamin	*B_1* (*Aneurin*)	*B_2* (*Riboflavin*)	*P.P.* (*Nicotinic Acid*)	*B_6*(*Pyridoxine*)	*C* (*Ascorbic Acid*)	*P* (*Hesperidin*)
Molecular Formula	$C_{12}H_{18}ON_4Cl_2S$	$C_{17}H_{20}N_4O_6$	$C_6H_5O_2N$	$C_8H_{11}O_3N$	$C_6H_8O_6$	$C_{28}H_{34}O_{15}$
Method of Assay { Biological Chemical Physical	Cure of polyneuritis (pigeon) or bradycardia (rat) Conversion to coloured or fluorescent substances (Thiochrome)	Growth (young rat). Colorimetric Fluorescence in ultra-violet light	Cure of black tongue (dog) Conversion to colour substances	Cure of dermatitis (deficient rats)	Cure of scurvy (guinea pigs) Reducing power	Ultra-violet absorption
Has been synthesized	Yes	Yes	Yes	Yes	Yes	No
Average daily requirements of a young child	200–500 I.U. (1–2 mg.)	1,000 gamma	20 mg. (?)	+	1,000 I.U. (50 mg.)	10 mg. (?)
Average daily requirements of an adult	700 I.U.	1,500 gamma	20–30 mg. (?)	?	500 I.U.	5 mg. (?)
Deficiency disease	Beri-beri	Cataract Neural degeneration Cheilosis Lack of growth (animals)	Pellagra	Dermatitis (in rats)	Scurvy	Capillary fragility
The best food sources	*Int. units per gm.* Meat 0·2–19 Roast pork 32 Ham 22 Fish 0·3–0·6 Milk 0·2 Cheese 0·3 Egg 14 Vegetables 0·3–1·6 Fruits about 0·4 Nuts 0·5–2 Whole wheat 23–34 Wheat germ 85–187 Oatmeal 3 Dried egg 6–23	*mg. per 100 gm.* Cow's milk 0·1 Hen's egg, yolk 0·5–0·6 white 0·4–0·5 Cod 0·05 Ox liver 0·1–2·4 Ox kidney 0·8–1·6 Yeast 1·8–3·6	*mg. per 100 gm.* Yeast 60 Liver 12·5 Skimmed milk powder 10·5 Whole wheat 5·3 Dried peas 1	Yeast + Liver + Fish +	*mg. per 100 gm.* Lemon juice 25–70 Orange juice 20–60 Black currant 130–220 Red currant 40–50 Marmalade 6–14 Tomatoes 12–25 Lettuce 3–8 Onions 2–10 Cabbage 20–40 Spinach 30–70 Milk 1–2	Lemon juice +

necessary to determine their potency by animal experiments and consequently the dosage was referred to in units, but now that most of them are available as pure chemical substances it has become increasingly common to give the dose in milligrams. With vitamins A and D, however, units are still employed.

The vitamins are often referred to as fat-soluble or water-soluble, but as the number of them has greatly increased in recent years it is convenient to regard them as major vitamins of definite and accepted importance, and minor vitamins, the need for which has not been finally established as far as human beings are concerned. Of the former group there are six, namely, A, B_1 (aneurin), B_2 (riboflavin), the pellagra-preventing factor (nicotinic acid), C (ascorbic acid), and D. Amongst the less important vitamins are B_6, pantothenic acid, E, K, and P. These may, in the future, be regarded as coming in the first group. The table of daily requirements shows the amounts now regarded as necessary to maintain good health.

Roughage.—Except in cases requiring intestinal rest, it is not desirable that the whole of the food should be absorbable. It is preferable that a moderate amount of unabsorbed residue (roughage) should remain to act as a stimulus to peristalsis of the intestine. Too much residue, such as results from purely vegetable diet, demands too much work on the part of the intestine, it is therefore necessary to select foods which will allow the required amount according to the patient's condition, i.e. in diarrhoea, where peristalsis is exaggerated, foods which leave little residue, such as rice or milk, are chosen, whereas in constipation, with diminished peristalsis, green vegetables and wholemeal bread are given.

Basal Metabolism and the estimation of B.M.R., see p. 125.

Calories.—The food supplied must be such as is capable of producing the energy for life and work, since the changes which food undergoes in the body are changes due to oxidation, the amount of heat which a food can yield on complete combustion is taken as a measure of its value as a source of energy. The standard unit of heat is a calorie (C). A large, or food calorie, represents the amount of heat required to raise one kilogramme (1 litre, or 35 fluid ounces) of water 1° C.

The average caloric value of food stuffs is recognized as:

1	gramme	protein	4·1	calories
1	,,	carbohydrate	4·1	,,
1	,,	fat	9·3	,,

For table of food values, see pp. 804–13.

To estimate the caloric value of food, proteins and carbohydrates should be multiplied by 4 and fats bv 9. Example: diet containing carbohydrate 50, protein 70, fat 80:

$50 \times 4 = 200$ cal. $70 \times 4 = 280$ cal. $80 \times 9 = 720$ cal.
Total calories 1200.

PROPORTION OF FOODSTUFFS IN THE NORMAL DIET

The average daily diet should contain about—

Protein	100 grammes	(3 oz.)	4·1 = 410 calories
Fat	100 ,,	(3 oz.)	9·3 = 930 ,,
Carbohydrates	400–500 ,,	(14 oz.)	14·1 = 1640 ,,

A balanced diet should contain:

(1) Energy value, i.e. about 3000 calories for a man engaged in moderate work, or for a boy of fourteen or over, 20–25 calories per pound body weight.

(2) Sufficient protein, about 100 grammes a day, for an adult, or 1 gramme per pound body weight (2 grammes per pound for an infant); of this, at least 37 grammes should be first-class protein, cheese, eggs, fish.

(3) Vitamins A, B complex, C, and D.

(4) The essential minerals.

(5) Water.

(6) Roughage.

The composition of foodstuffs is not sufficient guide to their nutritive value, they must be palatable, digestible, and readily absorbed. The calculation for diets may be made from the tables given on pp. 805–14.

Protective Foods.—Foods useful in supplying mineral matter and vitamins are spoken of as protective foods and include:

Milk (butter, cheese, soured milk, etc.). Fresh salads, vegetables, and fruits. Liver, including fish liver; the 'fat' fish (herrings, mackerel, salmon), and fish roes (cod- and halibut-liver oil); eggs. The use of these protective foods practically covers the demands of the body for mineral matter and vitamins.

Animal Foods.—The average composition of raw, lean meat is: water 72 per cent; proteins 20 per cent; fats 8 per cent. It also contains extractives and a fair proportion of salts. Most forms are quickly digested and easily assimilated. Kidney proteins are of the highest quality. Liver is of special value; its protein is good, it contains iron and the protective vitamins A and B. Poultry and game are also first-class proteins.

Fish.—The protein of fish contains the necessary amino-acids, and is a first-class protein. Fish contains less extractives than meat, more iodine and phosphorus.

Milk.—Milk has been called the 'perfect' food; it is the only food containing in itself all the foodstuffs in the required proportions. Human milk is the perfect food for the human infant. Milk alone would not provide a perfect diet for an adult, as too large a quantity would be necessary; it is also deficient in iron salts. It is an important adjunct to the diet of a child or adult as it provides first-class protein, and is one of the protective foods. It is advisable to allow one pint a day for each person or child.

Comparison of human and cow's milk:

Milk	*Water*	*Proteins*	*Sugar*	*Fats*	*Salts*
Human	87·0	2·2	6·5	4·0	0·3
Cow's	86·8	4·0	4·5	4·0	0·7

THE SERVING AND ADMINISTRATION OF FOOD

The following points should be observed in the serving and administration of patients' food.

Food must be served punctually and at regular intervals. The intervals should be long enough to allow the stomach to rest, but not long enough to cause exhaustion. As a general rule every two hours for liquid diet, every four hours during the day for solid diet.

The food to be daintily served. The tray must be clean on both sides and covered with a spotless tray cloth; the crockery and utensils used should be perfectly clean and neither chipped nor cracked and conveniently arranged; a serviette should be provided. The tray should not be crowded; a few flowers in a small vase or laid loosely on the tray will give pleasure and add to the attractiveness of the meal. Too much food should not be served, a second helping being given if desired and allowed. Plenty of time must be allowed for proper mastication. A daintily set tray will often tempt the patient to eat when there is a distaste for food.

Everything should be placed within easy reach of the patient, after arranging him in the most comfortable position possible before serving the food. Hot food must be served really hot on a hot plate or dish and covered with a hot cover; cold food must be perfectly cold, lukewarm food is unpalatable; ice may be served with cold drinks in summer if allowed.

The appetite should be tempted by varying the diet as much as possible, and giving small surprises. The patient should not be consulted about his food, but his likes and dislikes should be observed and followed when possible.

Worry, temper, excitement are all hindrances to digestion and should therefore be avoided; the sick-room should be tidy and the atmosphere rendered as pleasant as possible during meal-time.

Rich and highly seasoned or highly spiced food should be avoided. Liquid diet should be served in a feeder with a saucer, cup and saucer, or tumbler, which should be served on a small tray covered with a clean tray cloth or d'oyley. Care must be taken not to fill the feeder or cup too full and not to spill any food into the saucer.

In feeding patients who are lying flat the hand should be placed underneath the pillow to support and steady the head if necessary (p. 30). If a tumbler or cup is used it must only be half filled, otherwise the food will run down the patient's neck. The mouth should be carefully wiped or otherwise attended to after the food has been given. Unconscious patients should not be fed by mouth or choking may result. Infants should be turned on to the left side in the cot for feeding or else taken out on to the lap. The last meal at night should be light and not taken immediately before bed-time, as the digestive process is more sluggish during sleep. Only the amount of food and kind of food allowed must be placed on the patient's tray; for instance, if bread without crust is allowed the crust must be removed before serving, otherwise if the patient is very hungry he will not be able to withstand the temptation of eating more than he should.

General Division of Diets.—(1) Liquid diet, includes (*a*) milk diet and (*b*) mixed diet. (2) Low diet, semi-solids. (3) Fish, or fish and chicken diet. (4) Full or meat diet. (5) Infant feeding (see p. 592).

(1) **Liquid Diet.**—(*a*) **Milk Diet,** 5 pints.

(*b*) **Mixed Diet.**—Milk, 4 pints. Other liquids, 2 pints. Broths, beef-tea, barley water, rice water, albumin water, tea, coffee, etc.

(2) **Low Diet.**—Milk, 2 pints; 1 egg; broth, 1 pint; milk pudding, blancmange, jelly, bread and milk, Benger's food, tea, thin bread and butter, sponge cake.

(3) **Fish and Chicken Diet.**—Milk, 2 pints; 1 egg, fish or chicken, custard, milk puddings, jelly, bread and butter, etc.

(4) **Full Diet.**—Milk, 1 pint. Meat (4–6 oz.), vegetables, fruit, eggs, puddings, bacon, etc.

DIETS FOR GASTRIC ULCER AND HAEMATEMESIS

(1) Professor Meulengracht's Diet for Haematemesis.

6 a.m.	Tea, white bread and butter.
9 a.m.	Porridge with milk and white bread and butter.
1 p.m.	Dinner. Vegetable soups (vegetable rubbed through sieve). Either meat balls, timbale, broiled chops, omelette, or fish balls; mashed potatoes, vegetable *purée*. Stewed apricots, or apple sauce with either rice or tapioca pudding or gruel.
3 p.m.	Tea or cocoa made with milk.
6 p.m.	White bread and butter, sliced meat, and tea.

Patients may eat as much as they desire.

(2) Ulcer Diet (modified from above).

	First Day	*Second Day*	*Third Day and After*
6 a.m.	Porridge, milk, 5 oz.	Same	Same
8 a.m.	Egg in milk, 5 oz.	Add buttered rusk	Add 2 buttered rusks
10 a.m.	Milk, 5 oz.; barley sugar, 1 oz.	Add 1 slice of thin crustless bread and butter	Add 2 slices of bread and butter
12 noon.	Strained orange juice, 1 oz.; vegetable *purée* and cream	Same	Add portion of steamed fish
2 p.m.	Egg in milk, 5 oz., with barley sugar, 1 oz.	Add buttered rusk	Add 2 buttered rusks
4 p.m.	Milk pudding, 5 oz., with fruit juice	Add cream, 1 oz., and 1 slice of white bread and butter	Add 2 slices of white bread and butter
6 p.m.	Egg in milk, 5 oz.; barley sugar, 1 oz.	Add buttered rusk	Add 2 buttered rusks
8 p.m.	Milk pudding 2 oz.; fruit juice	Same	Same

At night when awake: *First feed*, milk, 5 oz. *Second*, egg in milk, 5 oz. *Between feeds* strained orange or strained tomato juice is given.

This diet is continued for 14 days or more and is followed by bland diet (see p. 791).

(3) **Lenhartz Diet.**—The total number of eggs for the day are beaten, measured, and divided into seven portions in medicine glasses and kept on ice until required. The egg feeds are given alternately with the milk. Seven egg feeds and six milk feeds during the 24 hours. Feeds are given hourly during the day; water is given during the night if awake.

Patients are not allowed to feed themselves, and all food is given by slow spoon feeding (p. 54).

TOTAL FOOD FOR DAY

Day 1. 2 raw eggs; milk, 3⅓ oz.
Day 2. 3 raw eggs; milk, 6⅔ oz.
Day 3. 4 raw eggs; milk, 10 oz.; sugar, 5 drachms.
Day 4. 5 raw eggs; milk, 13⅓ oz.; sugar, 5 drachms.
Day 5. 6 raw eggs; milk, 16⅔ oz.; sugar, 1 oz.
Day 6. 7 raw eggs; milk, 20 oz.; sugar, 1 oz.; scraped raw beef, 1¼ oz.
Day 7. 8 raw eggs; milk, 22½ oz.; sugar, 1 oz.; scraped raw beef, 2½ oz.; boiled rice, 3⅓ oz.

(4) **Sippy Diet.**—The sippy diet is one of small repeated doses of alkali with milk to neutralize acid in the stomach. Feeds are given every hour from 8 a.m. to 7 p.m. for the first two weeks.

TOTAL FOOD FOR DAY

First, second, and third day.—Milk 18 oz., cream 18 oz. The milk and cream are mixed together, 3 oz. of the mixture given at each feed.
Day 4. Same as Day 3, add 1 raw egg.
Day 5. Milk and cream mixture, 2 eggs.
Day 6. Milk and cream mixture, 2 eggs, 2 breakfast rusks, 3 oz. of orange juice.
Day 7. Milk and cream mixture, 2 eggs, 4 breakfast rusks, 3 oz. of orange juice.
Day 8. Milk and cream mixture, 3 eggs, 4 breakfast rusks, 3 oz. of orange juice.

The diet is continued as Day 8 until the fourteenth day, when a bland diet is given.

Bland Diet.—A bland diet is one which will not cause thermal, chemical, or mechanical irritation. It may be used as a continuation of one of the ulcer diets, after fluid diet, in the later stages of typhoid, etc. The diet may be compiled from the lists of foods given below, the amount being regulated according to the condition of the patient and the disease from which he is suffering.

General Instructions.—Meals are to be taken regularly and frequently, every three or four hours, the quantity being small. Food needs to be eaten slowly and well masticated. When cold and tired, food should not be eaten, a warm drink should be taken and the meal postponed until rested and warm.

Foods Allowed.

Milk.—Milk may be taken plain, or prepared in any way—junket, custard, milk puddings, milk soup, etc.

Cream.—Plain cream, made cream, ice cream, cream soups, etc.

Butter.—On bread, toast, rusks, or over vegetables or fish.

Fish.—Boiled, steamed, baked, or simmered in milk. Not fried.

Meat.—Beef or lamb occasionally, roasted or baked, not boiled or stewed. No outside slices.

Chicken, tripe, rabbit, brains, sweetbread, well cooked, but not fried.

Vegetables.—Potatoes, well cooked and mashed. Cauliflower, spinach, carrots, well cooked and rubbed through a sieve.

Fruit.—If raw avoid skin and pips. If cooked, rubbed through a sieve.

Various.—White bread, cut thin, or dry toasted. Any kind of smooth plain biscuit or rusk. Plain sponge cake, light Madeira cake without fruit. Jellies, plain chocolate, sugar, honey, golden syrup.

Drink.—Water, fruit juice (except lemon), milk, tea, or coffee, if very weak and with plenty of milk and taken sparingly.

Marmite, one teaspoonful in milk or vegetable water should be taken daily.

Very little should be taken to drink with meals, water and fruit juice may be taken between meals.

Foods Forbidden.

Soups, meats, etc.—Meat soups, rich gravies, twice cooked meat, tough meat, outside slices. Sausages, stews, made-up dishes, pork, 'high' game.

Fish.—Salmon, sardines, dried fish, and all fried fish.

Vegetables.—Cabbage, peas, beans, celery, onions, watercress, cucumber. Chip fried potatoes or crisps. Other vegetables must be passed through a sieve after cooking. Butter may be added to sieved vegetables, but they may not be cooked in fat.

Fruit.—Raw apple, melon, marmalade, jam, lemon peel, currants, raisins, figs, nuts, or any unripe or over-ripe fruit. No skins or pips.

Various.—New bread, brown bread, rich pastry or puddings, fruit cake, condiments of any kind, pickle, chutney, mustard, vinegar, alcohol. Smoke sparingly if at all.

Purin-free Diet

A purin-free diet is ordered in the treatment of gout, and may be made up from any of the following purin-free foods:

Milk, cheese (Gruyère, Limburger, Roquefort), hen's eggs, caviare, barley, rice, tapioca, sago, oatmeal, cucumbers, carrots, onions, apricots, apples, bananas, hazel nuts, oranges, pears, peaches, plums, grapes, tomatoes, pineapple, rolls, bread.

Marmite may be given, and very weak China tea.

The following foods containing a small amount of purin may be used in the later stages.

Cream cheese, cabbage, scarlet runner beans, white potatoes, lettuce, radishes, celery, cauliflower, asparagus.

DIET IN NEPHRITIS

Low Protein, Salt-free Diet.—As disease of the kidneys affects the whole cardiovascular system, dietetic restriction rests not only the kidneys, but the whole of the circulatory system and does much to prevent the increase of oedema, hypertension (p. 202), and complications such as heart failure (p. 276), hypertensive cerebral attacks (p. 377), and suppression of urine (p. 237). A preliminary period of starvation is advocated.

During the 'starvation' period the fluid taken is limited to the juice of 16 oranges (one pint of orange juice), sweetened with sugar if desired, in 24 hours. This restricted diet is continued until there is little or no oedema and the blood pressure is normal, usually within a week, but is not continued beyond 10 days.

The diet is then increased by the gradual addition of jellies, junket, custard, milk puddings, blancmange, bread and butter, jam, and vegetable *purée*. The fluids are restricted until all trace of oedema has disappeared. The diet is salt free, no salt is eaten with the food and none is used in cooking in the early stage, later salt may be used in cooking.

Foods Low in Sodium Chloride.—Thin cream instead of milk, flour, cornflour, yeast, shredded wheat, macaroni, rice, egg yolk, gelatine, sour milk, cheese, fruit, fudge, honey, jelly, grape fruit, orange juice, lemon juice, grapes, pears, water melon, asparagus, cucumber, tomatoes, onions, potatoes, cabbage, lettuce, rhubarb, apples.

LIVER DIET

Minot Murphy Liver Diet for Pernicious Anaemia.—Mammalian liver essential—calves', pigs', or beef, from 3–8 oz. (cooked weight) daily.

Encourage—kidneys, chicken livers; red meat, without fat; beef, lamb, mutton, calves' or ox heart.

Fruits.—Fresh, tinned, dried, up to 12 oz. daily—oranges, grape-fruit, raisins (steamed until soft before serving), prunes, strawberries, peaches, apricots, or pineapple.

Vegetables (cooked or raw).—Lettuce, cabbage, spinach, tomatoes, asparagus, onions, and other green vegetables.

Specimen diet, No. 1.

Breakfast.	Fruit juice, porridge, boiled egg, toast, butter, marmalade, coffee, and milk.
11 *a.m.*	Raw beef and liver sandwiches.
Lunch.	Fried liver, onions and tomatoes, macaroni, spinach, salad, fresh fruit, and toast.
Tea.	Biscuit, jam, fruit, fruit salad, and raisins.
Dinner.	Vegetable soup with scraped raw liver, underdone chop or steak or liver. Rice pudding with raisins, orange salad, or fruit.

Specimen diet, No. 2.

Breakfast.	Fruit, porridge, toast, butter, coffee, and milk.
Lunch.	Fried liver, tomato, onion, green vegetables. Rice pudding with raisins, stewed fruit, toast and butter; milk.
Tea.	Biscuits or Ryvita bread, jam, fruit, tea, and milk.
Dinner.	Vegetable soup with raw scraped liver, fish, meat or liver dish; asparagus, green vegetables. Milk pudding, stewed or fresh fruit.

REDUCING DIETS

Salisbury Diet.—Raw rump steak, 6 oz.; the steak is lightly grilled. Boiled cod-fish, 6 oz. Green vegetables, cabbage, spinach, not peas. Bread, 8–12 oz.; eaten as dry toast. Tea without sugar or milk; lemon may be substituted. Hot or cold water in moderation. This amount of food is divided into three meals in 24 hours, nothing else is allowed.

Banting Diet.—Animal food, 1 lb. Bread, 2 oz. Vegetables or fruit, 1 lb. Fluids (no milk), 35 oz. This amount of food is divided into three meals in 24 hours.

Slimming Diet.—A diet which effects a slow reduction and which is safe, under medical supervision, for ambulatory patients.

The standard weight (p. 854) should first be ascertained. The diet is then compiled to include 1 gramme of protein for every kilogramme of the standard body weight, with a low carbohydrate and fat content.

The skeleton diet given below will be found satisfactory as a basis from which to bring the diet to the required standard by adding more of the various foods allowed.

Rationed food.—Butter 1 oz., milk 4 oz., Ryvita or Vita Weat, 6 slices (or wholemeal bread 3½ oz.), is the total quantity of these foods permitted during the day.

On rising.	A glass of hot water.
Breakfast.	Half a grape fruit. Breakfast cupful of tea or coffee with milk from ration, no sugar, saccharine if desired. One egg, or small kidney grilled, or white fish. Two Ryvita slices, or a thin slice of wholemeal bread. Butter, from ration, a scrape.
11 *a.m.*	A glass of water, or cupful of clear soup, or Marmite, Oxo, or Bovril.
Lunch.	Average helping of either fish, lean meat, or cheese. Large helping of two vegetables. Two Ryvita slices, or one thin slice of wholemeal bread, butter from ration. Fruit, eaten raw, one apple, pear, or peach or other fruit not forbidden.
Tea.	Two cups of tea with milk from ration. Nothing to eat.
Dinner.	Clear soup. Meat, fish, or bird, thin gravy only. Two vegetables, large portions. Two Ryvita slices or remaining portion of bread. Butter, if any remains. Fruit as at lunch. Coffee, black or with any remaining milk.
Bedtime.	A glass of hot water with fresh lemon juice (no sugar), or cupful of Marmite made with vegetable stock.

Foods Allowed.

Soup.—Any clear soup made either from meat or vegetable stock.

Fish.—White fish, boiled, baked, steamed, grilled (not fried, no sauce). Sole, plaice, whiting, halibut, cod, smelts, perch, flounder, turbot, or half a lobster with pepper and vinegar (no mayonnaise).

Bird.—Chicken, turkey, quail, pigeon, or game birds.

Meat.—Beef, veal, mutton, lamb, hare, rabbit, liver, kidney, brains, sweetbread, tripe. All visible fat to be cut off. No thickened gravy.

Cheese.—Cheddar, Gruyère, Dutch.

Vegetables.—Cauliflower, cabbage, cucumber, brussels sprouts, leeks, spinach, mushrooms, tomatoes, French beans, runner beans, marrow.

Fruit.—Any fruit, eaten raw, except bananas.

Biscuit.—Any kind of plain biscuit or rusk may be substituted for Ryvita or Vita Weat.

Forbidden.—Any food *fried.* Sugar. Cakes, pastry, puddings, jam, marmalade. All vegetables growing in pods, peas, etc., or under the ground, potatoes, beetroot, etc.

Fruit.—Bananas. Cooked fruit.

As the patient approaches his normal weight the diet may be increased, first add one pint of milk, later root vegetables, bread, etc., regulating the amount to the loss or gain in weight.

Diet in Typhoid Fever

Diet in Typhoid Fever.—In the early stages of typhoid fever the diet given should average 50 calories per kilogramme of the patient's standard body weight. Food should be given every two hours up to midnight, every four hours if awake during the night.

Daily Diet

Milk, 2 pints
Cream (thin), ½ pint
Eggs (4), beaten with milk, soft boiled, or made into custard
Sugar or lactose, 4 oz.
Marmite, 1 teaspoonful
Orange or strained tomato juice, 12 oz.
Breakfast biscuits (4), useful, as they need mastication, thus stimulating the flow of saliva

Plenty of water is essential, and may be given between feeds. Additions or variations may be made from the following: milk made up as junket, milk jelly, milk soup, blancmange, or flavoured with tea, coffee, chocolate. Cream may be taken with jelly, in tea, coffee, and chocolate. Plain chocolate may be eaten, jellies of any kind, and any fruit juice. At least 6 oz. of fruit juice should be taken.

Sponge cake, thin white bread and butter without crust, plain biscuits, honey, or apple, bramble, elderberry, or cranberry jelly, but no jam. Coffee is laxative and should be given sparingly or not at all. When the temperature falls and the stools are normal the diet is increased to a bland diet (see p. 792).

Ketogenic Diet

Ketogenic Diet.—Ketogenic, or 'high fat,' diets are composed chiefly of fat, some protein, and very little carbohydrate. Since ketogenic diets are poor in calcium, cheese should be substituted for meat as often as possible, and calcium lactate may be given. Vitamin deficiency is prevented by giving Marmite (B), cod-liver oil (A and D), fresh tomato (C).

Forbidden.—Sugar, sweets, bread, or starchy food of any kind, and fruit is restricted on account of its high glucose value.

An average diet would be made up of carbohydrates 24, proteins 64, fats 310 (for food values, see p. 805), using the following foods:

Cream, 12 oz.
Eggs, 2
Butter, 5 oz.
Fat meat, 1 oz.
Cheese, 3 oz.
Lettuce
Gooseberries
Rhubarb
Onions
Tomatoes
Cabbage boiled in three waters

Agar jelly is of no food value and makes a pleasant change to help with the cream. Frozen egg yolk and cream with flavouring will make ices.

Ketogenic diet is prescribed in epilepsy; and in infection (Bacillus coli) of bladder or kidney, but latterly mandelic acid treatment or sulphathiazole (M & B 760) (p. 776) have been found more successful.

Calcium Diets.—A diet with *low* calcium content is required during research periods on the calcium metabolism in patients suffering from hyperparathyroidism (p. 297) and osteomalacia (p. 301). The diet is continued for 6–9 days; during this time the faeces are examined for the calcium output. It is also needed in plumbism (p. 383) in conjunction with drugs to promote elimination of lead from the bones.

A *high* calcium diet is required in the treatment of all calcium deficiency diseases, i.e. tetany (p. 300), rickets (p. 601), osteomalacia (p. 301), exophthalmic goitre (p. 297), in plumbism with toxic symptoms, lead colic (p. 383), after operation on the parathyroid gland (p. 300), in adolescence to prevent dental caries, in pregnancy and during lactation. Calcium lactate, 5 grammes three times daily, may be added to a high calcium diet. Vitamin D is also given in the form of either cod-liver oil, halibut oil, Greenosan, or Radiostol.

The basis of a high calcium diet should consist of 1 quart of milk, 2 eggs, ¼ lb cheese, to which any other foods of high calcium content may be added to make up the diet.

FOODS WITH A LOW CALCIUM CONTENT

Honey
Apples
Bananas
Rice
Tomatoes
Potatoes
Butter
Pears
Cucumber
Radishes
Grape-fruit
Biscuits
Macaroni
Tapioca
Lemon juice
Bread
Onions
Shredded wheat
Lettuce
Rhubarb
Cabbage
Oranges
Prunes
Parsnips
Meat

With a *low* calcium diet, rain water, or distilled water, should be used for drinking and cooking purposes.

FOODS WITH A HIGH CALCIUM CONTENT

Cheese
Turnip tops
Condensed milk
Skimmed cow's milk
Whole cow's milk
Watercress
Dried beans
Figs
Egg yolk
Caviare
Brown bread
Cauliflower
Olives
Lentils
Endive
Dandelion
Cocoa
Buttermilk
Chocolate
Fish
Shrimps
Walnuts
Cream
Currants (dried)
Meat extract
Dried peas
Egg

A high calcium fluid diet may be given as 1 quart of milk, 2 eggs and Casec (Mead, Johnson & Co.), 2 oz.

Low Residue Diet.—A diet with a low residue is given in colitis (p. 223), various intestinal conditions, and after operations for haemorrhoids (p. 497). The diet is compiled from foods leaving little residue, varying the quantities according to the condition of the patient.

Foods leaving little residue. — Milk, white bread toasted, butter, orange juice, spinach *purée*, tomato *purée*, jellies, egg, Marmite, soup made with milk and vegetable *purée*.

High Residue Diet is given to promote peristalsis in certain cases of constipation (p. 221).

Foods with high residue.—Meat, fish, fruit, vegetables, oatmeal, bran, brown or currant bread, Vita Weat, puddings, jam, honey, coarse brown sugar, fruit cake, gingerbread.

Avoid tea, cocoa, chocolate, rice, tapioca, cheese, milk, eggs, fried foods.

Two glasses of water, hot or cold, taken before breakfast and before retiring are very beneficial.

Coffee is laxative, tea constipating.

R. D. Lawrence's 'Line Ration' Scheme for a Diabetic Diet

Instructions to Patients

Normal persons use and burn the sugar and starchy foods they eat to give them heat and energy, like a good fire or engine burning good coal. Diabetics cannot burn sugar or starchy foods, such as flour, bread, rice, potatoes, etc., which become sugar when digested. Such foods only lead to an accumulation of sugar in the body, which is wasted in the urine and poisons diabetics and produces symptoms of illness. Their ordinary diet of sugar and starch foods must therefore be restricted, and it is often necessary to eat an exact weighed diet, at least at the beginning of treatment. In severe diabetics, when restricted diet fails to get rid of the excess of sugar in the body, insulin injections must often be given, and an exact diet and insulin dosage are essential. Insulin enables the diabetic to burn sugar like a normal person, and thus restores health.

Your doctor will prescribe a certain number of Rations a day. One Ration is one complete Line and consists of one B and one R portion. Any B portion can be added to any R portion to make one Ration; but two B portions or two R portions must not be combined to make a Ration. Thus equal numbers of B's and R's must usually be taken together, but your doctor may prescribe especially for insulin cases. The B portions are the foods containing starch or sugar (known as carbohydrates), and the different weights of the various foods all contain the same amount of carbohydrate. Thus ½ ounce toast equals 8 ounces of carrot in sugar value. As 8 ounces of carrot is usually too much to eat, the patient will often arrange to take a half-portion (or less) of such bulky foods. Detailed samples of meals are given below.

All foods are to be weighed *cooked*, except fats like butter and the articles marked 'raw.' Accurate weighing on a confectioner's or other suitable scales is essential. Weights of from 8 to ¼ ounce are required and a measuring glass for fluids. A new penny weighs ⅓ ounce; a halfpenny ⅕ ounce. All foods are to be cooked in the ordinary domestic way, but *no sugar* or *flour* is to be used. Saccharin may be used as desired for sweetening. Full details for patients about diet and insulin are published in *The Diabetic A.B.C.*, by R. D. Lawrence.

Patients are warned against foods rich in sugar or starch which are not mentioned on page 800 because they are unsuitable for use. Such are actual sugar, jams and sweets, pastries and tea-cakes, etc.

If you are taking insulin, the correct balance between your diet and insulin must always be maintained. *Never stop insulin* without your doctor's orders. If you are unable to eat your usual solid diet, take the B portions as milk or orange or even sugar (2 lumps or teaspoonfuls equal 1 B portion) and inject your usual insulin. If you are unable to take even a sugared drink, take half your usual insulin and consult your doctor at once. If you are ill, go to bed and send for your doctor.

Examples

BREAKFAST, 3 LINES	PORTIONS	FAT, OZ.
Kipper, 2 oz.	2 R	½
One egg	1 ,,	
Tomatoes, two (extra)	—	
Milk, 7 oz.	1 B	
Bread, 1⅓ oz.	2 ,,	
Tea or coffee (extra)		
	3 B, 3 R	½

Fat taken as ½ oz. of butter.

DINNER, 4 LINES	PORTIONS	FAT, OZ.
Lean roast beef, 3 oz.	3 R	¾
Potato, 4 oz.	2 B	
Boiled leeks, 4 oz.	½ ,,	
Stewed apple, 8 oz.	1 ,,	
One egg } Custard	1 R	
Milk, 3½ oz. } Custard	½ B	
	4 B, 4 R	¾

The fat could be used as ¾ oz. of beef fat or ¾ oz. of butter or 1½ oz. of cream.

The 'Line Ration' Diet Scheme

One B portion added to one R portion = one Line ration

B

PORTIONS

(10 gm. C.)

Carbohydrate Foods (containing Sugar or Starch)

Flour, rice, sago, tapioca (raw), ⅖ oz.
Biscuit, toast or breakfast cereals; oatmeal, macaroni (all dry), ½ oz.
Bread (all kinds), ¾ oz.
Potato, peas or beans (dried or tinned); banana or grapes; dried apricots (stewed), 2 oz.
Parsnips; ripe greengages; prunes (stewed), 3 oz.
Raw apple, pear, cherries, gooseberries, plums, damsons, orange (skinned); young peas or beetroot, 4 oz.
Peach or apricot (ripe); greengages (stewed); broad beans, 5 oz.
Strawberries; stewed pears, damsons or plums, 6 oz.
Milk; raspberries or melon (ripe), 7 oz.
*Apples or cherries (stewed); carrots or leeks, 8 oz.
*Jerusalem artichokes; loganberries; blackberries (stewed), 10 oz.
*Grapefruit (in skin); tomatoes; red currants or black currants (stewed), 12 oz.
*Onions, turnips or radishes, 14 oz.

*Half portions of these are usually enough.

Negligible starch content in average helpings of

Asparagus, green artichokes, French beans, Brussels sprouts, cabbage, cauliflower, celery, cranberries, cress, cucumber, egg plant, endive, stewing gooseberries, greens, horseradish, lemons, lettuce, marrow, mushrooms, radishes, rhubarb, salsify, scarlet runners, seakale, spinach.

R

PORTIONS

(7½ gm. protein and 9 gm. fat)

Protein and Fat

One egg.
Bacon or ham (both lean), ⅖ oz.
Kidney, 1¼ oz., and fat, ¼ oz.
Liver, 1 oz., and fat, ¼ oz.
Tongue (tinned or fresh), 1 oz.
Tripe or sweetbreads, 1¼ oz., and fat, ¼ oz.
Lean beef or veal, 1 oz., and fat, ¼ oz.
Lean lamb or mutton, 1 oz., and fat, ¼ oz.
Lean pork, 1 oz.
Chicken or pigeon, 1 oz., and fat, ¼ oz.
Duck, 1 oz.
Pheasant, grouse, or partridge, ¾ oz., and fat, ¼ oz.
Rabbit or hare, ¾ oz., and fat, ¼ oz.
Crab or lobster, 1¼ oz., and fat, ¼ oz.
Herring, 1 oz., and fat, ¼ oz.
Kipper, 1 oz., and fat, ¼ oz.
Salmon, 1 oz., and fat, ¼ oz.
Sardines, 1 oz.
White fish (all kinds), 1¼ oz., and fat, ¼ oz.
Cheese, ¾ oz.

Fats are meat fats, suet, dripping, butter, margarine, olive oil; thick cream in twice the amount stated for other fats.

Extras of no Food Value

Tea, coffee, soda water, Bovril, Oxo, etc., ordinary condiments and flavourings.

Explanation to Doctors

The instructions to patients afford an idea of the working of the scheme, but further explanation is now given of the number of Lines required for each patient. Each Line Ration=10 grammes carbohydrate (B), 7½ grammes protein and 9 grammes fat (R). Each Line has a calorific value of 155 calories and the number of Lines to provide any number of calories can be obtained from this. But the following general indications will prove simple and useful in deciding on the diet of different types of cases, depending on whether they need insulin or not.

Diet for Mild Cases, usually obese, middle-aged: If they have no ketone (acetone) bodies in the urine, try a 10-Line diet for 3 weeks, distributing the B portions equally in 3 or 4 meals. If glycosuria disappears the diet can be increased; if not, insulin is necessary.

For Insulin Cases where diet has failed, or who have heavy ketonuria, more carbohydrate is usually advisable. Try 15 or even more B portions (i.e. 150 grammes C.) with 10 R's as shown on the card, giving most C. at breakfast and evening meals, if insulin is given morning and evening; or spreading the C. more equally if protamine insulin is used. It must be remembered that variations are required for different patients, especially children.

For full practical details of diet and insulin see *The Diabetic Life*, by R. D. Lawrence.

In mild cases the weighing of food may be unnecessary and in others impossible. A simpler card for such cases (*Unweighed Diabetic Diet*, by Lawrence) is also published by Messrs. H. K. Lewis & Co. Ltd. (see p. 13, *Diabetic A.B.C.*).

A SIMPLE DIABETIC DIET

(Unweighed)

By R. D. LAWRENCE, M.D., F.R.C.P.

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FOODS ALLOWED

Protein and Fats

Small *or* average helpings of **animal foods** (fresh or tinned), such as beef, veal, mutton, pork, bacon, ham, liver, kidney, tripe, etc.; eggs; poultry, game; fish, shell-fish, cheese.

Fats, such as meat fats, butter, cream, olive oil, dripping.

Carbohydrates

and **Group 1. Unlimited amounts of the following vegetables and fruit:**

Vegetables.—Asparagus, artichokes (green), Brussels sprouts, cabbage, cauliflower, celery, chicory, cress, cucumber, egg-plant, endive, French beans, greens, horse-radish, lettuce, marrow, mushrooms, olives, onions, pawpaw, pumpkin, radishes, scarlet runners, seakale, spinach, tomato.

Fruit.—Black or red currants, cranberries, lemons, stewing gooseberries, and rhubarb.

and **Group 2.** One helping from the following vegetables and fruit (=about 5 grammes C.):

Three tablespoonfuls of—

Vegetables.—Carrots, Jerusalem artichokes, leeks, turnips.

Fruit, Stewed.—Apples, apricots, blackberries, cherries, damsons, greengages, pears, plums. **Fruit, Fresh.**—Loganberries, raspberries, and strawberries;

Or ½ grapefruit or ½ banana; or small apple or orange, peach or plum; or melon (small slice); or almonds (12), or walnuts (6), or brazils (6).

and **Group 3.** The following exact quantities (=about 10 grammes C.):

Bread (¾ oz.) cut to fit metal measure; or **In place of one bread portion you can take** either—Potato (size hen's egg) or small banana: milk, teacup (7 oz.): ¼ lb. apple or pear; or 2 oranges, peaches, or plums: oatmeal, rice, or tapioca, 1 dessertspoon: Ovaltine or Benger's, 2 teaspoons: 2 plain biscuits, such as cream crackers, 'breakfast,' 'Marie,' 'petit beurre' (H. & P.), or 2 sections Vitaweat, Ryvita.

Specimen unweighed diet 180 grammes carbohydrate arranged for twice daily dose of soluble insulin.

Breakfast. 50 C.	1 dessertspoonful oatmeal as porridge (10). Cream. ¼ cup milk (3) from daily ration. 1 level teaspoonful of ordinary marmalade (10). 3 portions of bread cut to measure (30). Bacon, average helping. Tea or coffee.
11 *a.m.* 10 gram.	Bovril. 2 plain biscuits.
Lunch. 20 C.	Meat, average helping. Vegetable Group 1, unlimited. 1 potato, size hen's egg (10). 2 portions Group 2 (10). Cream.
Tea. 20 C.	2 portions bread (20). ¼ cup (2 oz.) milk. Lettuce. Tomato. Cheese.
Supper. 50 C.	Fish or egg. 4 portions bread (40). Butter. 2 portions fruit or vegetables, Group 2 (10).
Bedtime. 10 C.	1 cup milk extra to ration.
15 C.	Daily ration milk, ½ pint.
5 C.	Cover Group 1 not counted.
180	Daily total C.

FORBIDDEN FOODS

The following must not be taken, unless specially allowed, because they contain much sugar or starch, which produces sugar in diabetics:

Sugar, jams, sweets, flour, biscuits, cakes, pastry, porridge, rice, tapioca, sago, tinned and dried fruits, peas, dried beans; grapes, figs, dates, pineapple; beer, stout, cider, port, sweet minerals (lemonade, ginger beer, ginger ale, tonic water); sausages. Fresh fruit and milk, bread and potatoes only as allowed, Groups 1, 2, 3. Special 'diabetic' breads or biscuits or sweets only as ordered by doctor. **Do not use sugar, flour, or breadcrumbs in cooking.**

Urine Tests

When visiting your doctor, always take your diet card and a small bottle of urine passed on rising.

Sickness or Illness in Insulin Cases

If you are unable to eat your usual solid diet, take at least your usual **bread portions** or other foods **in place of them,** chosen from the following:

One bread measure equals one cup milk; or ½ cup orange juice; or 2 teaspoons Ovaltine or Benger's; or 2 teaspoons sugar. Arrange your diet from these, take plenty of fluid (water or tea) and inject your usual insulin. Never stop insulin without your doctor's orders, but if unable to keep down even a sugared drink, take half your usual insulin and get in touch with a doctor at once.

Allowed

Drinks.—Tea, coffee, water, soda, fresh lemonade, clear soups, beef tea, bovril, etc. Consult doctor about alcohol, if wanted.

Seasoning.—Saccharine for sweetening; salt, pepper, vinegar, mustard, oil, unsweetened pickles.

For special dishes and recipes, insulin injections, urine tests, and so on, see *The Diabetic A.B.C.*

The metal measure for bread can be had from Messrs. H. K. Lewis & Co. Ltd.

FIVE-GRAMME DIET SCHEME

This method of compiling a diabetic diet has several advantages over the Line Ration Scheme (p. 799). It allows greater choice of food; it gives the patient a better understanding of the principles of diabetic dieting; it allows diets of any proportion of carbohydrates, proteins, and fats to be easily arranged.

Method of calculating a Diet.—The physician prescribes the total daily amount of carbohydrates, proteins, and fats, and may also indicate the amount to be taken at each meal and roughly the type of food. Further details are usually left to the nurse or patient to work out.

Example.—Physician's instruction—amount prescribed for the day in grammes, 100 C., 100 P., 120 F. to be divided into four meals. No insulin. Allowance: 25 C., 25 P., 30 F.

Breakfast

First work out the carbohydrate (25 C.).

	C.	P.	F.	C.	P.	F.
Porridge, ¾ oz. raw oatmeal . . .	15	3	3			
Milk, 3 oz.	5	3½	3			
Tomato, 6 oz.	5	1½	0			
	25	8*	6*	25	8	6

Next work out the protein (25 P.). 8 P.* have already been used as 'incidental' protein * in the carbohydrate food, leaving 17 P. to be added.

	C.	P.	F.	C.	P.	F.
Fried bacon, 1 oz.		5	15			
2 eggs		12	11			
		17	26*		17	26

Lastly the fat. Incidental fat * amounts to 32, so no more is added.

	C.	P.	F.	C.	P.	F.
Total for breakfast (*carried forward*) .				25	25	32

		C.	P.	F.	C.	P.	F.
Brought forward					25	25	32
	Dinner						
Clear soup	.	0	0	0			
Roast beef	1⅓	0	10	10			
Brussels sprouts, once boiled	10	5	7	0			
Bread	1	15	3	0			
Cheese, Cheddar	⅔	0	5	5½			
Butter	[illegible]	0	0	15			
Tomato	6	5	1½	0			
					25	26½	30½
	Tea						
Tea	.	0	0	0			
Milk	3½	5	3½	3½			
Egg, one	.		6	5½			
Ham, fried	1½	0	10	15			
Bread	1	15	3	0			
Tomato	6	5	1½	0			
Butter	⅙	0	0	5			
					25	24	29
	Supper						
Salmon	3	0	15	9			
Potato, boiled	4	20	2	0			
French beans, once boiled	8	2½	1½	0			
Cheese, Cheshire	⅔	0	5	5½			
Cucumber, raw	5	2½	1	0			
Butter	⅖	0	0	10			
Cream, thick	½	0	0	5			
Coffee	.	0	0	0			
					25	24½	29½
Total for day					100	100	121

FOOD TABLES FOR THE FIVE-GRAMME SCHEME

(From *The Diabetic Life*)

* *These articles have practically no carbohydrate value when eaten in average helpings.*

† *Allowance should be made for any fat used in cooking.*

Calculation of the Calorific Value of a Diet (see p. 787)

CARBOHYDRATE FOODS (C.)

(Vegetables, fruit, bread, cereals, milk, etc.)

5 *Grammes of Carbohydrate are contained in*	*Gm.*	*or Oz.*	*And these amounts also contain grammes of*	*P.*	*F.*
Almonds	115	4	Without shells	24	56
Apples	54	2	With skin	0	0
,,	42	1½	Without skin	0	0

CARBOHYDRATE FOODS (C.)—*continued*

5 Grammes of Carbohydrate are contained in			*And these amounts also contain grammes of*		
	Gm.	*or Oz.*		*P.*	*F.*
Apples	114	4	Stewed, without sugar	0	0
Apricots	80	2¾	Fresh, with stones	1	0
	192	6¾	Fresh, stewed	1½	0
	28	1	Dried, stewed, no sugar	0	0
Arrowroot	5	⅛	Uncooked	0	0
Artichoke, Jerusalem	140	5	Boiled once as served	½	0
*Artichoke, green	360	12¾	Edible part ⅓ total weight	1	0
*Asparagus	455	16	Fresh, boiled once, edible part	15	0
	455	16	Tinned	15	0
			Edible part=total weight		
*Avocado pear	280	10	As purchased	1	0
Banana	24	1	Without skin	0	0
Barley	7	¼	Raw	1	½
Beans	70	2	Broad, boiled once	3	0
	30	1	Butter, boiled once	2	0
	455	16	French, boiled once	3½	0
	30	1	Haricot, boiled once	2	0
	555	19½	Scarlet runner, boiled once	4½	0
Beetroot	50	1¾	Boiled once	1	0
Benger's Food	6	⅕	As purchased	½	0
Bilberry	135	4¾	As purchased	0	0
,,	200	7	Stewed, no sugar	0	0
Biscuit	7	¼	Average, unsweetened	1	0
Blackberries	78	2¾	As purchased	1	0
,,	156	5½	Stewed	1½	0
Black currants	76	2½	As purchased	½	0
,,	156	5½	Stewed	1	0
Bread	10	⅓	Average white	1	0
,,	11	⅓	Average brown	½	0
*Brussels sprouts	295	10	Boiled once	7	0
Buttermilk	100 c.c.	3½		3	1
*Cabbage (average)	500	17½	Boiled once	5	0
Calf's foot jelly	28	1	As purchased	1	0
Carrots	116	4	Boiled once	½	0
*Cauliflower	417	15	Boiled once	6	0
*Celery	385	13½	Raw, edible portion	3½	0
,,	710	25	Boiled once	4	0
Cherries	48	1¾	Including stones, raw	0	0
,,	112	4	Stewed, without sugar	½	0
Chicory	193	6¾	Raw	3	0
* ,,	278	10	Boiled	3	0
Chocolate	12	⅓	Average	½	2
Cocoa	12	⅓	Average	3	4
Coco-nut	135	4¾	Fresh, edible portion	5	46
,, milk	105	3¾		½	0
Cornflour	6	⅕	Uncooked	0	0
Cranberries	143	5	Raw	½	0
Cream	111 c.c.	3¾	Average thin, hand-skimmed	2½	20

CARBOHYDRATE FOODS (C.)—*continued*

5 Grammes of Carbohydrate are contained in			*And these amounts also contain grammes of*		
	Gm. or	*Oz.*		*P.*	*F.*
*Cress	555	19½	Uncooked	9	0
*Cucumber	278	9¾	Raw, without skin	1½	0
,,	340	12	Boiled once	½	0
Currants	8	¼	Dried	0	0
Custard apple	37	1¼	As purchased	2	0
Custard powder	6	⅙	As purchased	0	0
Damsons	58	2¾	Raw, with stones, ripe	½	0
,,	76	2	Unripe, stewed	½	0
Dates	7	¼	Dried	0	0
Egg plant	151	5¼	As purchased	1	0
* ,,	336	12	Boiled	1½	0
Egg powder	10	⅓	As purchased	½	0
*Endive	500	17½	Raw, edible portion	2½	0
*Fennel	312	11	Raw, edible portion	5	0
Figs	52	1¾	Green, as purchased	½	0
,,	9	⅓	Dried	½	0
,,	26	1	Dried, then stewed	0	0
Flour	7	¼	Average	1	0
Force	7	¼	As purchased	½	0
Gooseberries	54	2	Raw, ripe	0	0
* ,,	294	10	Unripe gooseberries, stewed	½	0
Grape fruit	188	6	Weighed with skin	½	0
,,	94	3¼	Edible part	½	0
Grapenuts	6	⅙	As purchased	0	0
Grapes	31	1	Fresh	0	0
Greengages	42	1½	As purchased, ripe	0	0
,,	66	2¼	Unripe, stewed	0	0
*Greens	555	19½	Average mixed, boiled once	9	0
Honey	6	⅙	As purchased	0	0
Horlick's Malted Milk	7	¼	As purchased	1	½
Horseradish	45	1½	Raw	2	0
Jam	8	¼	Average	0	0
*Kale	1000	35	Boiled once	9	0
Leeks	108	3¾	Boiled once	2	0
*Lemon	312 c.c.	11	Juice	0	0
*Lettuce	278	10	Raw, whole	3	0
Loganberries	147	5¼	Raw	1½	0
,,	216	7½	Stewed	1½	0
Loquats	22	¾	As purchased (old analysis)	0	0
Macaroni	31	1	Boiled once	1	½
,,	7	¼	Raw	1	0
Mango	40	1½	With stone (old analysis)	0	0

CARBOHYDRATE FOODS (C.)—*continued*

5 Grammes of Carbohydrate are contained in	*Gm.*	*or Oz.*	*And these amounts also contain grammes of*	*P.*	*F.*
Marmalade	6	⅕	Ordinary	0	0
,,	166	5¾	Diabetic, Callard's, Keiller's, etc.	0	0
*Marrow, vegetable	356	12½	Boiled once	1½	0
Medlar	58	2	As purchased	0	0
Mellin's Food	6	⅕	As purchased	½	0
Melon	96	3½	Edible portion	1	0
Milk	100 c.c.	3½	Fresh	3½	3½
,,	28 c.c.	1	Condensed, unsweetened	3	3
,,	14	½	Dried	3½	3½
,,	100 c.c.	3½	Skimmed	4	½
Mulberries	62	2¼	As purchased	1	0
,,	105	3¾	Stewed, no sugar	1	0
Mushrooms	.	.	See list of 'Extras' (p. 814)		
*Mustard and cress	555	19½	Raw	16	1
Nectarines	40	1½	As purchased, ripe	0	0
Nuts	122	4¼	Brazil, without shell	17	70
,,	14	½	Chestnut, no shell	3	4
,,	75	2½	Hazel, without shell	7	25
,,	58	2	Peanuts, no shell	16	27
,,	45	1½	Pistachio, no shell	10	23
,,	100	3½	Walnut, without shell	13	49
Oatmeal	.	.	See Porridge		
Okra	125	4½	As purchased (old analysis)	1	0
Olives	.	.	No sugar nor starch content		
Onions	195	7	Boiled once	1	0
,, spring	59	2	Raw	½	0
Oranges	78	2¾	With skin	½	0
,,	59	2	Without skin	½	0
,,	53 c.c.	2	Juice	0	0
Ovaltine	7	¼	As purchased	1	½
Parsnips	37	1⅓	Boiled once	½	0
Passion fruit	193	6¾	As purchased	0	0
Pawpaw	140	5	As eaten	1	0
Peaches	63	2¼	Fresh, whole	½	0
,,	100	3½	Fresh, stewed	½	0
,,	42	1½	Dried, stewed, no sugar	½	0
Pears	66	2½	Fresh, with skin	0	0
,,	28	1	Tinned	0	0
,,	77	2¾	Stewed without sugar	0	0
Peas, green	65	2¼	Very young, boiled	3	0
,,	40	1⅓	Average, boiled once	2½	½

CARBOHYDRATE FOODS (C.)—*continued*

5 Grammes of Carbohydrate are contained in	*Gm.*	*or Oz.*	*And these amounts also contain grammes of*	*P.*	*F.*
Peas, green	25	1	Dried, boiled once	2	0
,,	30	1	Green, tinned	2	0
Persimmon	60	2	As purchased	0	0
Pickles	119	4	Mixed, unsweetened	1	½
Pineapple	43	1½	Fresh, edible portion	0	0
,,	42	1½	Juice only	0	0
Plums	55	2	Ripe Victoria, with stones	0	0
,,	95	3¼	Smaller varieties, ripe	0	0
,,	82	3	Stewing varieties, stewed	1	0
Pomegranate	77	2¾	As purchased	0	0
Porridge	7	¼	Raw oatmeal	1	1
(See also Quaker Oats)	43	1½	Boiled oatmeal	1	1
Potato	25	1	Boiled once, or raw	½	0
,,	10	⅓	Chips, fried in fat	½	4
,, sweet	25	1	Cooked	1	0
Prunes	15	½	Dried, with stones	0	0
,,	32	1¼	Stewed without sugar	0	0
Quaker Oats	7	¼	Weighed before cooking	1	½
,,	71	2½	Cooked	1	½
Radishes	179	6½	Raw	2	0
Raisins	7	¼	Dried	0	0
Raspberries	90	3¼	As purchased, ripe	1	0
,,	132	4½	Stewed without sugar	1	0
Red currants	114	4	As purchased	1	0
,,	150	5¼	Stewed, without sugar	1	0
*Rhubarb	720	25	Stewed once without sugar	3	0
Rice	6	⅕	Raw	0	0
,,	20	⅔	Boiled once	½	0
Ryvita	7	¼	As purchased	1	0
Sago	6	⅕	Uncooked	0	0
,,	50	1¾	Boiled once	0	0
†Salsify	333	12	Boiled once	½	0
Sauerkraut	130	4½	As purchased	2	½
Sausage	.	.	See protein section		
†Sea-kale	840	30	Boiled once	2	0
†Sorrel	500	16	Boiled once	2	0
Soya flour	20	¾	As purchased	8	4
†Spinach	358	12	Boiled once	18	0
Strawberries	81	3	Fresh, ripe	½	0
Sugar	5	⅙	. . . . .	0	0
Tapioca	6	⅕	Raw	0	0
,,	20	⅔	Boiled once	½	0

CARBOHYDRATE FOODS (C.)—*continued*

5 Grammes of Carbohydrate are contained in	*Gm.*	*or Oz.*	*And these amounts also contain grammes of*	*P.*	*F.*
Toast	8	¼	Well toasted	½	0
Tomatoes	180	6	Raw, or cooked, or tinned	1½	0
Truffles	84	3	Cooked (old analysis)	5	½
Turnips	220	7¾	Boiled once, mashed	1½	0
Turnip tops			See Greens		
Vegetable marrow			See Marrow		
Vita Weat	7	¼		1	0
†Watercress	715	25	Raw, whole	21	0
Whey	100 c.c.	3½		1	½

PROTEIN FOODS (P.)

(Meat, fish, poultry, eggs, etc.)

5 Grammes of Protein are contained in	*Gm.*	*or Oz.*	*And these amounts also contain grammes of*	*P.*	*F.*
Anchovies	22	¾	As purchased		½
Bacon	28	1	Fat, fried		15
,,	21	¾	Lean, fried		10
Beef	20	⅔	Roast, with fat		5
	20	⅔	Roast, lean		1
	24	¾	Steak, lean, fried		5
	18	⅔	Boiled		3
	22	¾	Corned		3
	20	⅔	Pressed		3
	100 c.c.	3½	Raw beef juice		1
Bovril			See list of 'Extras' (p. 814)		
Brains	42	1½	As purchased		3
Calf's foot jelly			See Carbohydrates		
Caviare	17	½	As purchased		3
Cheese	18	⅔	Rough average		5
	17	½	American		5
	26	1	Brie		5
	24	¾	Camembert		6½
	19	⅔	Cheddar		5½
	19	⅔	Cheshire		5½
	20	⅔	Gorgonzola		6
	17	½	Gruyère		5
	17	½	Roquefort		5
Cheeses, fatty	20	⅔	Full cream		8

PROTEIN FOODS (P.)—*continued*

5 Grammes of Protein are contained in	*Gm*	*or Oz.*	*And these amounts also contain grammes of*	*P.*	*F.*
Cheeses, fatty .	20	⅔	St Ivel		7
,, .	14	⅔	Stilton		7
Cheeses, protein	14	½	Dutch		2
,, .	12	⅓	Parmesan		2
Chicken . .	18	⅔	Average, roast or boiled .		1½
Clams . .	47	1⅔	Raw, without shell .		½
			(1⅔ oz. clams also contain 2 gm. C.)		
Cod . .	28	1	Boiled		0
Crab . .	26	1	Edible portion		1
Crayfish . .	30	1	Edible portion . . .		½
Duck . .	22	¾	Average, roast		5
Eels . .	45	1½	Cooked, edible portion .		8
Eggs, hen's .	14	½	Dried, weighed before cooking		5½
			1 average whole egg contains	6	5½
			The white of 1 egg contains	3½	0
			The yolk of 1 egg contains	2½	5½
,, duck's			1 average whole egg contains	10½	10½
Egg powder			See Carbohydrates		
Fish .			See under various names		
Fowl .			See Chicken		
Gelatine .	5	⅙	As purchased		0
Goose .	18	⅗	Roast		4
Grouse .	16	½	Cooked		1
Guinea hen	15	½	Cooked		1
Haddock .	23	¾	Boiled		0
,, .	22	. ¾	Smoked, boiled . . .		0
Hake .	27	1	Boiled		1
Halibut .	22	¾	Boiled		1
Ham .	22	¾	Boiled, lean only . .		3
,, .	.	.	With fat		7½
Hare .	17	⅔	Cooked		1
Herring .	23	¾	Fresh cooked		4
,, .	22	¾	Salt, cooked		4
Kidneys .	19	⅔	Cooked		1
Kipper .	21	¾	Boiled		2
Lamb .	22	¾	Roast		2½
,, .	23	¾	Chop, steamed . . .		2½
Lemco .	.	.	See list of 'Extras' (p. 814).		
Liver .	17	⅗	Cooked		3
Lobster .	24	¾	Edible portion, fresh or tinned		1
Mackerel .	30	1	Boiled		2
Meat .			See Beef, mutton, etc.		

PROTEIN FOODS (P.)—*continued*

5 Grammes of Protein are contained in			*And these amounts also contain grammes of*		
	Gm.	*or Oz.*		*P.*	*F.*
Mullet	23	¾	Cooked		1
Mussels	30	1	Raw, without shell		½
Mutton	20	⅔	Roast		4
,,	19	⅔	Boiled		3
,,	16	½	Chop, lean, grilled		4
Oxo	.	.	See list of 'Extras' (p. 814)		
Oysters	50	1¾	Without shell		0
Partridge	14	½	Cooked		0
Pâté de foie gras	36	1⅛	As purchased		13
Pheasant	16	½	Cooked		1
Pigeon	23	¾	Boiled		1
,,	19	⅔	Roast		3
Pig's feet	30	1	Edible portion, cooked		8
Plaice	28	1	Steamed		½
Pork	20	⅔	Roast		6
,,	17	⅝	Chop, lean, cooked		5
Prawns	61	2	As purchased		½
Quail	22	¾	Cooked		1½
Rabbit	19	⅔	Stewed		1½
,,	14	½	Roast		1½
Roe	23	¾	Fish, fried		3
Salmon	26	1	Boiled		3
,,	25	1	Tinned		3
Sanatogen	6	⅕	As purchased		0
Sardines	25	1	Tinned		6
Sausage, beef	33	1¼	Fried } weights contain also		6
,, **pork**	42	1½	Fried } 5 gm. C		9
Shrimps	20	⅔	Edible portion		0
,,	45	1½	As purchased		0
Skate	31	1	Boiled		½
Smelts	20	⅔	Cooked		6
Sole	28	1	Steamed		0
Sprats	22	¾	Cooked		8
Stock	83	3	Clear		1
Sweetbreads	22	¾	Cooked		2
Tongue	25	¾	Ox, tinned		6½
,,	27	1	Ox, fresh, boiled		6
,,	28	1	Sheep's, boiled		7
Tripe	28	1	Boiled		1
Trout	22	¾	Cooked		1
Turbot	24	1	Boiled		0
Turkey	17	⅝	Roast		1

PROTEIN FOODS (P.)—*continued*

	5 Grammes of Protein are contained in		*And these amounts also contain grammes of*		
	Gm.	*or Oz.*		*P.*	*F.*
Turtle	26	1	Green		0
	83 c.c.	3	Soup, as purchased .		1
			(3 oz. soup also contains 3 gm. C.)		
Veal .	16	½	Roast		2
,, .	16	½	Cutlet, cooked . . .		1
Venison .	17	⅔	Roast		1
Whitebait	27	1	Fried		13
Whiting .	25	1	Steamed		0

FATS (F.)

	5 Grammes of Fat are contained in		
	Gm.	*or Oz.*	*Remarks*
Bacon fat	6	⅕	
Beef fat .	6	⅕	
Butter .	6	⅕	
Cod-liver oil	5	⅙	
Cream .	29	1	Hand skimmed (20 per cent)
	13	½	Thick (40 per cent)
	8	¼	Clotted (Devonshire)
			Thin (see Carbohydrate list)
Dripping . .	5	⅙	
Lard . .	5	⅙	
Margarine .	6	⅕	Average
Marrow, beef bone	5	⅙	
Mutton fat .	6	⅕	
Olives . .	25	1	
Olive oil . .	5	⅙	
Suet . .	5	⅙	

'EXTRAS' OF 'NO FOOD VALUE'

For practical purposes the following may be regarded as of no food value if taken in moderate quantities:

Food	*Remarks*
Weak tea .	No sugar, no milk
Weak coffee . . .	No sugar, no milk

'EXTRAS' OF 'NO FOOD VALUE'—*continued*

Food	*Remarks*			
Thin clear soups and broths, e.g. beef-tea, chicken broth, etc.	Thickening agents (flour, etc.) must not be added			
		C.	*P.*	*F.*
Bovril	⅛ oz. really contains	0	1	0
Oxo	⅙ oz. ,, ,,	0	1	0
Lemco	⅙ oz. ,, ,,	0	1	0
Marmite	⅙ oz. ,, ,,	0	2	0
Lemon juice	1 oz. ,, ,,	1	0	0
Horseradish	¼ oz. ,, ,,	1	0	0
Mixed pickles	1 oz. ,, ,,	1	0	0
Vinegar	In small amount			
Mushrooms	In small quantities			
Bran	Must be well washed under tap			
Agar-agar	Used in preparation of bran biscuits, jellies, etc. (p. 822)			
Gelatine	A very small amount may be used in special jellies			
Saccharine	To sweeten food and drink. Add to the food just before serving			
Liquid paraffin (medicinal)	Used for frying, and salad dressing			
Mustard or pepper	In very small quantities			
Salt	In moderation			
Jams and marmalade (diabetic)	In small quantities			
Flavouring materials	Almonds, essence of Brandy Cloves Coffee Lemon juice, lemon peel Orange peel Parsley Sage Vanilla Whisky or dry sherry Or any containing no starch or sugar			

DRINKS FOR DIABETICS

Allowed (*No carbohydrate content*)	*Forbidden* (*Contain sugar or starch*)
Water and soda	Beer and ale
Tea and coffee unsweetened	Stout and cider
Clear soups, Bovril, etc.	Champagne and sweet wines
Lemonade without sugar	Vermouth
	Port and liqueurs

RECIPES—MILK PREPARATIONS

Peptonized Milk.—Take 1 pint of new milk, add 5 ounces of boiling water, heat to a temperature of 105° F.; add 2 teaspoonfuls of liquor pancreaticus with 20 grains of soda bicarbonate, stir. Keep the milk at the above temperature for 10 minutes, then bring quickly to the boil. If it is desirable not to boil the milk it should be placed on ice when peptonized instead of boiling. Instead of liquor pancreaticus, one tube of Fairchild's Zymine may be used, or 5 grains of Armour's Extract Pancreaticus, with 20 grains of soda bicarbonate.

Pasteurized Milk.—Place the milk in a double saucepan and maintain at a temperature of 155°–167° F. for 20 minutes. The milk should then be rapidly cooled and placed on ice or in a cool place.

Sterilized Milk.—Place the milk in a double saucepan and maintain at a temperature of 212° F. for 15 minutes. Cool it rapidly and keep covered in a cool place.

Humanized Milk.—Allow 1 pint of milk to stand for 6 hours, then skim off the cream and place it in a jug; add half the skimmed milk and boil. Make the remainder of the skimmed milk into whey with rennet (see below); heat the whey to a temperature of 150° F., and add it to the mixture, which after sweetening is ready for use and should not be diluted. Add one teaspoonful of sugar to a quantity of 3 ounces.

Koumiss.—Heat 1 quart of new milk to a temperature of 75° F. Dissolve 1½ tablespoonfuls of white sugar in 1 tablespoonful of lukewarm water and stir it into the milk, add ¼ of a yeast cake, or 1 tablespoonful of brewer's yeast. Fill sterilized bottles to within 1½ inches of the top, cork tightly and shake. Place the bottles upside down in a temperature of 70° F. for 10 hours, then in an ice-chest or in a cool atmosphere for three days, when it will be ready for use. Sterilized ginger-beer bottles with screw corks may be used, if ordinary corks are used they should be new and boiled and should be secured with wire; bottles corked in the latter way when in use should be fitted with a champagne tap.

Junket.—Heat ½ pint of new milk to a temperature of 100° F., sweeten to taste, pour into a glass dish, add 1 teaspoonful of rennet, stir, and allow it to stand until set. Serve with whipped cream. A little powdered cinnamon or grated nutmeg may be sprinkled over the top if desired.

Milk-bovril.—Put 1 teaspoonful of bovril into a breakfast cup, fill up with boiling (not boiled) milk. Add salt or pepper to taste. Serve hot. Marmite may be used in place of bovril.

Milk Soup.—Two teaspoonfuls of flour, 1 oz. of butter, ½ pint of milk, tomato or potato.

Melt the butter in the saucepan and stir in the flour, add the milk, gradually stirring all the time. Rub the tomatoes or potatoes through a sieve and add to the milk. Flavour to taste.

White Wine Whey.—Heat ½ pint of new milk to nearly boiling point; add 2 ounces of common sherry, allow the mixture to stand until the curd has separated, then strain through muslin. Lemon whey is made similarly by adding 1 teaspoonful of lemon juice to ½ pint of milk.

Whey.—Add 1 teaspoonful of essence of rennet to 1 pint of milk which has been warmed to a temperature of 100° F.; allow it to stand before the fire till the curd has set, then break up the curd with a fork; allow it to stand for 15 minutes, then strain off the curd through muslin and bring the whey to boiling point.

Milk Jelly.—To ½ pint of milk add ¼ ounce of leaf gelatine, pinch of salt, sugar and flavouring to taste, either cinnamon or vanilla; stand it on a stove until the gelatine has melted, then strain it into a wetted mould. Serve cold with cream. Sherry may be used for flavouring but should not be added until the gelatine has melted.

Egg Jelly.—Beat an egg, and add ½ pint of lemon water or any fruit juice with sherry and sugar to taste, place in a saucepan with ¼ ounce leaf gelatine. Stir until melted, then pour into a wetted mould.

Clabber, or Sour Milk Jelly.—Set 1 quart of new milk in a covered bowl at the back of the range until the milk begins to turn; remove to a moderately warm place until firmly set, which will take from 12 to 24 hours. Serve with cream and sugar. This form of milk can often be digested when milk is not tolerated.

Bread and Milk.—Heat ½ pint of new milk, cut one slice of stale bread into squares, removing the crust; put the bread into the milk and bring it to the boil. Serve with either sugar or salt. Toast may be used instead of bread if desired.

Arrowroot.—Take one dessertspoonful of arrowroot, mix into a thin paste with a little cold milk or water; pour ½ pint of boiling milk or water quickly over it, then boil slowly for 5 minutes with constant stirring. It may be sweetened to taste or served with a tablespoonful of brandy added to it.

Benger's Food.—Make fresh twice daily and use as required. For recipe see directions on the tin.

Milk Coffee.—Into a warmed jug put two tablespoonfuls of ground coffee, pour on ½ pint of boiling water, stir vigorously, then allow it to stand in a warm place for 5 minutes. Bring ½ pint of new milk to the boil, pour in 1 tablespoonful of coffee, serve with sugar.

Milk Tea.—Into a heated teapot put one teaspoonful of tea, pour on 1 ounce of boiling water, allow it to stand for ½ minute, then pour into a cup and add ½ pint of boiling milk. Serve with sugar if desired.

Oatmeal Gruel.—Into a pint of boiling water run through the fingers two heaped tablespoonfuls of oatmeal and a pinch of salt, stirring all the time; allow to boil briskly for two minutes then cook slowly for one hour, stirring occasionally; strain, and thin to the required consistency with hot (not boiled) milk, and serve very hot. Cream may be added when desirable. Sugar may be added to taste.

Egg Preparations

Albumin Water.—Take a new-laid egg, separate the white from the yolk, cut the white with a clean pair of scissors or beat it, but not sufficiently to cause a froth. Add five ounces of cold water, beating all the time. Sugar to taste, and add a few drops of fresh lemon juice, or orange juice. This is most nourishing and very easily digested; it may be given before operations instead of beef-tea (p. 809). It is also useful for infants who cannot digest milk, but in these cases ten ounces of cold water should be added to the white of one egg and the lemon juice omitted.

Egg Flip.—Thoroughly beat up a new-laid egg, adding gradually a dessertspoonful of castor sugar, a pinch of salt, and one tablespoonful of brandy; when well mixed add ½ pint of cold milk. If preferred the milk may be added almost boiling.

Egg Flip with Coffee, Tea, or Cocoa.—Beat up the egg, sugar to taste, add one tablespoonful of cold milk, pour on to the mixture a cupful of either hot tea, coffee, cocoa, or hot milk as desired. If plain milk is used it may be flavoured with vanilla.

Custard.—Thoroughly beat up one new-laid egg with a dessertspoonful of castor sugar, a pinch of salt, and a few drops of vanilla essence, add ½ pint of new milk, beating all the time, strain through a sieve into a dish. For a baked custard place in a moderate oven for 15 or 20 minutes; for boiled custard place in a pan of water and steam for 20 minutes or until set.

Omelette.—Thoroughly beat up the yolk of two eggs, add two ounces of milk, salt and pepper to taste; beat up the white of the eggs on a plate with a knife until frothy, then stir into the mixture. Put a teaspoonful of butter in a clean hot frying-pan, when the butter is melted and hot, pour in the mixture, shake the pan, turn up a corner of the omelette to see when cooked, when brown fold it over and turn on to a hot plate. Serve immediately.

Egg Jelly. See jelly, p. 815.

Snowball Eggs.—Place one pint of milk in a saucepan on the fire with the rind of a lemon or a little vanilla, and sufficient white sugar to sweeten. Break three eggs, separating the white from the yolk. Put 1½ teaspoonfuls of powdered white sugar on a plate. Beat the whites into a stiff froth, adding a pinch of salt, then add to the sugar and mix briskly. Take a teaspoonful of this mixture and throw it into the boiling milk in the saucepan, turn it three minutes later; remove it with a skimmer, and place it on a dish. Take as many spoonfuls of the mixture as remain, and cook in a similar manner (if the white of egg has been sufficiently beaten each spoonful will be a compact mass). Dress the snowballs in a pyramid dish. Pour the remainder of the milk from the saucepan into the yolks of the eggs; put this mixture into another saucepan on the fire, stir it constantly until thick, but do not allow it to boil. Pass it through a sieve and when cold pour it over the snowballs in the dish.

BROTHS AND SOUPS

Beef-tea.—Take one pound of lean beef (gravy beef), remove all fat, skin, and gristle, cut it into small cubes about ¼ inch square; place it in a jar and add one pint of cold water, cover it tightly. Place the jar in a pan of cold water over a slow fire, or better in a hot oven, and allow it to simmer for four hours; strain through a sieve, pressing all the goodness out of the meat, remove any fat or scum from the surface, add salt to taste, and serve hot.

Chicken Tea.—Procure one old fowl or cockerel, joint it, cut all the meat from the bones, cut the meat up into small pieces, and chop the bones. Cleanse the giblets. Put the whole into a deep saucepan, and add enough cold water to cover it, add salt and pepper, and a small piece of celery or sprig of mace may be added. Cover with a lid and bring slowly to the boil, and allow it to simmer from four to five hours. Strain through a hair sieve and allow it to cool. When cold remove all fat. This broth may be eaten cold as a jelly or heated; it may be thickened with rice, arrowroot, or the yolk of an egg.

Milk Soup.—See p. 816.

Mutton Broth.—**Veal Broth.**—*Ingredients.*—3 lb. of the scrag of mutton; 1 quart of cold water; 1 onion; ½ teaspoonful of salt; a sprig of parsley. Cut the meat up fine, and chop the bones into pieces. Put the meat, bones, and other ingredients into a saucepan, and bring slowly to the boil, taking care to remove the scum as it arises. Keep it covered and allow it to simmer slowly for 4 hours. Strain through a hair sieve. When cold remove the fat from the surface with a spoon. Heat when required. Rice or barley may be added if wished. About one tablespoonful of well-washed rice or barley is added to the strained broth and boiled until soft. For veal broth, substitute veal for the mutton.

Raw Meat Juice.—Take ¼ lb. of rump steak, finely shred and pound the meat. Add two tablespoonfuls of cold water, or just sufficient water to cover the meat; allow it to stand covered in a cool place for 1 hour, then strain through muslin, squeezing out the juice from the meat as completely as possible. Dose for an infant 6–12 months old, one to four tablespoonfuls in 24 hours.

Tomato Soup.—*Ingredients.*—5 ounces of tomato *purée*, 2 teaspoonfuls of flour, butter (size of half a walnut).

Melt the butter in a saucepan, remove from the fire, add the flour, making it into a paste, put in the vegetable juice and cook for a few minutes; add the milk bringing it gradually to boiling point and stir until thick. Onion may be used for flavouring if desired by cooking shredded onion in the milk before adding it to the soup.

VARIOUS

Raw Meat Sandwiches.—Scrape the pulp from a good, raw steak, season to taste and spread on thin slices of bread previously spread with a small quantity of butter. Make into a sandwich, trim the edges so that no meat is showing, cut into small squares and garnish with parsley.

Raw Meat Balls.—With a knife scrape all the juice and pulp out of ½ lb. of raw rump steak, leaving nothing but the fibrous tissue behind. Mix with cream, add salt and pepper to taste, and roll into balls. Heat a baking tin very hot, and moisten it with butter to prevent the balls sticking; roll them rapidly over the hot surface and serve immediately. If cream may not be taken it can be omitted; but the addition of cream and rolling the balls over a hot surface will take away the objectionable appearance whilst the condition of rawness remains unaltered.

Cheese Soufflé.—*Ingredients.*—Half-ounce of butter, ¼ ounce of flour, 1 tablespoonful of milk, 1 egg, 1 ounce grated cheese, seasoning to taste. Melt the butter in a saucepan, remove from the fire and add the flour, milk, and seasoning, boil once, remove from the fire and add the yolk of the egg, beat well, add the cheese, and lastly the stiffly-beaten white of egg. Put into a greased soufflé dish and bake in a hot oven from 5–10 minutes. Serve immediately.

Liver Savoury.—Raw liver, scraped or finely-minced, well mixed with tomato ketchup or Worcester sauce to taste. Spread on toast and garnish with sliced tomato.

Liver Cocktail.—Take ½ lb. liver, mince finely, press through a potato squeezer, then rub through a hair sieve. Mix with the juice of three oranges, strain. Port wine or sherry may be added just before serving. This quantity may be used either as one, or for two doses.

Sandwiches of Raw Liver are made using wholemeal bread spread thinly with butter then raw liver. They may be served with lettuce or tomato, and if desired may have grated cheese added.

Calf's-foot Jelly.—Thoroughly clean two feet of a calf, cut into pieces, and stew in 2 quarts of water until reduced to 1 quart; when cold take off the fat, and separate the jelly from the sediment. Put the jelly into a saucepan with 5 ounces of sherry, or 2 ounces of brandy, the shells and whites of 4 eggs well mixed together and flavouring to taste. Boil for quarter of an hour, cover it, and allow to stand for a short time; strain through a flannel bag into a mould whilst hot. Serve cold.

Oysters au Naturel.—Open the oysters carefully and serve them in their shells. Season with pepper, salt, and a pinch of cayenne. Garnish with parsley or cut lemon. Serve directly they are opened. or the flavour will be spoilt. They are best eaten with a little brown bread and butter. Oysters may be peptonized and then given, and are an excellent and easily digested food.

Oysters Scalloped.—Put six oysters and their liquor into a small saucepan, and bring them to the boil. Remove the beards from the oysters and strain the liquor. Grease china or well-washed oyster shells. Sprinkle into each dish a few bread crumbs, and then place three oysters in each shell. Season to taste with pepper and salt. Pour over a little oyster liquor and cover with more bread crumbs. Pour some melted butter over the top. Brown in the oven or in front of the fire and serve hot.

BEVERAGES

Barley Water; Rice Water; Oatmeal Water.—Wash two tablespoonfuls of pearl barley in cold water; place in half a pint of cold water and bring to the boil; throw the water away, add two pints of cold water, bring to the boil, and allow to simmer gently until reduced to one pint; strain and serve cold with a little lemon juice or sliced lemon and sugar, or if preferred it may be taken hot. Unflavoured barley water may be used to dilute milk either for infants or adults, and also as a substitute for milk in intestinal cases. In making barley water for infants, proceed as above, only using one tablespoonful of barley instead of two.

When using prepared barley mix one dessertspoonful of barley with a little cold water into a paste; then add half a pint of boiling water, pour into a saucepan and boil for five minutes with constant stirring; the above quantities are suitable for infants, for adults use a tablespoonful of prepared barley to half a pint of water.

Rice water and oatmeal water are made in the same way as barley water, using either rice or oatmeal instead of pearl barley. When given instead of milk in intestinal cases, these drinks are given cold without flavouring except to sweeten to taste.

Toast Water.—Toast two slices of bread to a dark brown; place in a jug and pour over one quart of boiling water; cool and when cold strain. Serve cold with either a little lemon juice or a slice of lemon.

Apple Water.—Slice into a jug ½ dozen juicy sour apples; add one tablespoonful of sugar, and pour on two pints of boiling water. Cover closely until cold, then strain. Serve cold. The juice of one lemon may be added.

Lemonade.—Squeeze the juice of one lemon with a lemon squeezer; add sugar to taste, and dilute with iced water either plain or aerated. The juice of an orange may be used in the same way.

Peel the rind off one lemon very thinly, taking care not to include any of the white, remove the white from the lemon, and cut the lemon into slices, place in a jug with the rind, add one tablespoonful of sugar, and pour on half a pint of boiling water. Strain when cold, or if desired it may be strained and taken hot.

Hot Lemon and Whisky.—Squeeze the juice of one lemon into a tumbler, add sugar to taste, and one tablespoonful of whisky, fill up with boiling water. Serve immediately. Very useful as a diaphoretic (p. 767).

Imperial Drink.—Dissolve 1 ounce of potassium tartrate, 1 ounce of tartaric acid, 16 ounces of white sugar, and 12 minims of oil of lemon in 1 gallon of boiling water, stir well and keep covered until cold. Serve cold, using equal quantities of the drink with either plain or soda water. Very useful as a diuretic (p. 767).

Another method.—Dissolve one large teaspoonful of cream of tartar in one pint of boiling water, add sugar and the juice of one lemon, strain and serve cold.

Black Currant Tea.—Place one tablespoonful of black currant jam in a tumbler, fill up with boiling water, strain and serve hot.

Linseed Tea.—Wash one ounce of whole linseed and pour over it one quart of boiling water; simmer to half the quantity; strain and add juice of one lemon and sugar to taste. When used as a demulcent drink (p. 771) in cases of poisoning omit the lemon juice.

Ginger Tea.—Mix half a teaspoonful of ginger in a tablespoonful of golden syrup, add a cupful of boiling water, and boil for one minute. Serve hot. If preferred milk and water may be used instead of water. Useful as a carminative (p. 766), and in abdominal cramp.

Raisin Tea.—Chop ¼ lb. of raisins and place in an earthenware jug. Pour over ½ pint of boiling water and leave covered until cool. Strain and use as required.

DIABETIC PREPARATIONS

Bran Cakes.—Cattle bran, two large breakfastcupfuls; 3 eggs; dripping or butter, 1 oz.; 1 teaspoonful of each of the following: ginger, salt, and baking powder.

Tie the bran in a muslin bag and hang under the cold water tap until the water runs through quite clearly. Squeeze as dry as possible and put in a basin. Add the salt, ginger, and baking powder. Beat the yolks and whites of the eggs separately, the whites to a stiff froth. Melt the dripping and add to the mixture, stir well, then add the yolk of the eggs, and finally the whites. After well mixing divide the mixture into 16 cakes, put into greased patty pans and bake in a quick oven for 20 minutes. Each cake counts as Protein 1, Fat 3.

Agar Jelly.—Flaked agar-agar, ¼ oz.; warm water, 1¼ pints.

Put the agar into a saucepan and pour the water over it, stand it at the side of the fire until melted, stirring it occasionally. When quite clear add one tablespoonful of the flavouring mixture and pour into a wetted mould until set.

If desired the jelly may be coloured with cochineal. Flavouring essences and saccharine may be used instead of the flavouring mixture.

Flavouring Mixture for Agar Jelly

℞

Citric Acid, ℥ij.
Ol. Limonis, ♏xx.
Saccharine, gr. xxv.
Aq. Dest. Ad., ℥viij.
Fiat mist.

Use as directed.

CHAPTER XXVIII

BACTERIOLOGY

History.—The first man to set eyes on the minute living forms which we call microbes, germs, or bacteria, was a Dutch draper, Anthony van Leeuwenhoek, who for a hobby ground lenses with which he constructed microscopes. One day he placed a drop of water from a rainwater butt under one of his microscopes and was surprised to see rod-shaped organisms swimming about in the water. This was about the year 1670.

Pasteur in 1870 examined pus from a case of puerperal fever and saw in it a microbe in the form of a chain. He immediately jumped to the conclusion that the microbe was the cause of the fever, and enunciated his germ theory to account for disease.

As time went on more and more germs were found causing various illnesses of men, animals, and plants. On the other hand, germs were discovered of importance in industry, as such processes as the ripening of cheese and tobacco, fermentation, etc., were found to be due to their action. The decomposition of dead animal matter and vegetation is also due to the action of bacteria.

In the course of time so much was discovered about bacteria, that a new branch of biology was created and the study of bacteria is now called Bacteriology.

Cells.—If one takes a thin shaving from the stem of a plant and examines this under a microscope, it will be seen to be composed of rows of small box-like compartments. The appearance is very like the surface of a honeycomb, and because of this likeness the term 'cell' is applied to each of the box-like compartments. In the same way animal tissue of every kind is found to be made up of enormous numbers of cells adjoining each other. In the plant stem the wall of each cell is rigid and composed of a substance called cellulose; enclosed by the cell wall is the living substance known as *cell protoplasm* or *cytoplasm*, composed of protein matter, and in the middle of the cytoplasm is seen a denser circular body known as the *nucleus*. The nucleus is all-important because it is the living part of the cell and without it the protoplasm dies. A plant grows by multiplying the number of cells, and this occurs by the nucleus first dividing into two, and then the protoplasm collects around each of the new nuclei and a new cell wall forms between them.

An animal cell has no rigid cellulose wall, but is merely bounded by a condensation of the cytoplasm to form a membrane to which we give the name *cell membrane.* Division occurs as in vegetable cells by the nucleus first dividing into two and each part surrounding itself by a portion of the protoplasm.

Bacteria are composed of a single cell bounded by a cell membrane enclosing the cytoplasm, and it is generally accepted that a nucleus of some sort, whether it be in the shape of discrete granules, a filament, or one or more masses of nuclear material, is contained within the cytoplasm. The cell membrane is generally invisible, but it may be made obvious by placing the organisms in salt solution of 2·5 per cent strength, which causes the cytoplasm to contract and leave the envelope visible. Sometimes the cell membrane is thick and gelatinous and easily seen and we then call it a *capsule.* When bacteria have thick glutinous capsules they may adhere together in jelly-like masses which we call *zoogloea.*

We may define bacteria as minute unicellular vegetable organisms, which lack the green colouring matter, known as chlorophyll, possessed by plants, and also differing from plants in having a cell membrane composed, not of cellulose, but of a protein substance.

The *chemical composition* of bacteria varies, but all contain proteins, fatty substances known as lipoids, and inorganic salts. The proteins are mainly globulins and nucleo-proteins. Carbohydrates are generally scanty. The cytoplasm often contains granules of fatty and protein matter, of pigment, and, in some species, of sulphur or of starchy matter. Some bacteria have granules, especially at either end, which stain purple or pinkish with many blue stains and these are called metachromatic granules.

Motility.—When bacteria are suspended in a fluid and viewed with a microscope they all exhibit an oscillatory movement which we call *Brownian movement.* This is caused by the molecules of the fluid, which are always in motion, hitting against the organism and driving it about irregularly through the fluid. In addition to Brownian movement some species of organisms are able to move about in the fluid, and we call these organisms *motile.* Motility is due to the possession of *flagella,* which are minute whip-like threads attached to the ends and sides of the cell membrane. The flagella vibrate to and fro and thus act as propellers. The length and number of flagella vary with different species of bacteria; some are short and straight, others long and wavy, and whilst some bacteria possess only one or two at one or both ends, others have many surrounding the whole cell. When an organism moves rapidly it is said to be actively motile and conversely when it moves slowly, sluggishly motile. The speed at which an organism moves does not necessarily depend on the number of flagella which it possesses; thus an organism possessing only one flagellum may be more actively motile than one possessing many and vice versa. For motility to occur the organism must be young and in surroundings favourable to growth and development.

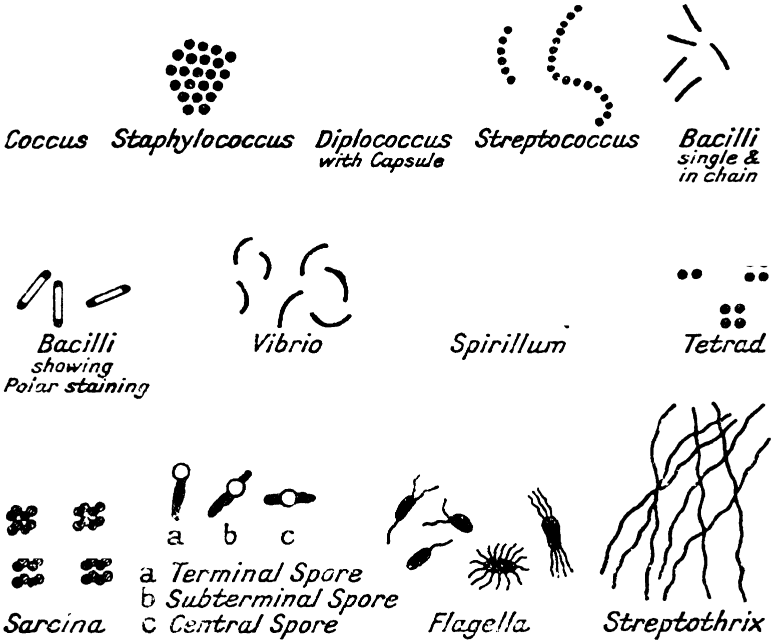

FIG. 268. Types of bacteria.

Reproduction.—There are two methods by which bacteria reproduce themselves, namely, by *simple division* or *fission*, and by *spore formation*. Both processes are generally considered to be non-sexual, and while simple division is common to all species, only certain types of bacteria are able to form spores. In simple fission at about the middle of the bacterium there occurs a constriction, which becomes deeper until it divides the cell in two parts. As the division always takes place transversely, never longitudinally, it is called *transverse fission*, and since two bacteria are formed from one, it always results in an increase in number.

In organisms which have flagella at one end, after division it is always the non-flagellated end which bears the flagella of the new cell.

Spore formation only occurs in old cultures when conditions of life are becoming difficult owing to scarcity of food substance and the accumulation of waste products resulting from the growth of the organism; it is a means of prolonging the existence of the species until conditions once again become favourable to growth and development. The spore forms in the following way: In the middle of the cell an opaque granule appears which becomes larger, and at the same time a condensation of the cytoplasm surrounding it takes place, until finally the spore is enclosed by a fairly dense impermeable membrane able to resist drying and fairly high temperatures. The diameter of the spore may be the same as that of the parent cell or much greater, and its position may be at the centre, at the end, or at a short distance from the end, and from these positions the spore is said to be central, terminal, or subterminal respectively. Only one spore is formed for each organism and thus there is no increase in number. When conditions again become favourable the spore germinates; it becomes less opaque, then swollen and granular, a slight protuberance appears, which enlarges until the capsule ruptures, allowing the emergence of an organism similar to the parent one.

Bacteria vary in shape, but may usually be grouped under five forms (see Fig. 268). The cell may be:

(1) Spherical, when it is called a *coccus*.
(2) Elongated and straight—a *bacillus*.
(3) Elongated and curved—a *vibrio*.
(4) Elongated and twisted—a *spirillum*.
(5) Long and filamentous—a *streptothrix*.

Certain names are given to bacteria to describe the manner in which they divide, thus the term *streptococcus* is applied to an organism which divides regularly and forms chains, but if after division the pairs of organisms remain separate they are called *diplococci*. When an organism divides irregularly and forms masses resembling bunches of grapes it is called a *staphylococcus*. *Tetrads* form groups of four organisms by division in two planes, whilst *sarcinae* form packets of eight organisms by division in three planes.

Size.—As all bacteria are microscopic, a special measurement called a *micron*, denoted by the Greek letter μ (Mu), is used to describe their magnitude. A micron is one-thousandth of a millimetre (0·001 mm.) or one-twenty-five-thousandth of an inch. The size of bacteria, either in diameter or length, varies from 0·3 μ to 30–40 μ.

Mode of Life.—Bacteria which live an independent existence, obtaining their food substances from rotting vegetation or from the bodies of dead animals, are called *saprophytes*, while those which live within the body of a living animal or plant, called a *host*, and derive their nourishment from the products of digestion of the host are called *parasites*. Many bacteria are capable of existing both as saprophytes and parasites. When from their conjoint mode of life the host and parasite derive mutual benefit they are said to live in *symbiosis*. The food substances consist mainly of proteins and carbohydrates which are absorbed and digested and furnish the carbon, hydrogen, and nitrogen of which the bacterial cell is composed, as well as the energy required for its various life processes. We give the name of *metabolism* to the process whereby food is digested, absorbed, and utilized. In addition to proteins and carbohydrates inorganic salts, such as chlorides, phosphates, and sulphates, are essential. All these substances must be supplied in the presence of water, for without water bacterial life soon ceases, and, although spores may survive a long time without it, even they eventually die if they become too dry. See p. 783.

Temperature.—All bacteria grow best at a certain temperature called the *optimum temperature*, which varies among different species. For organisms which infect man and animals, the optimum temperature usually lies between 95°–104° F., and above 104° F. growth and reproduction gradually cease, while practically all spore-free bacteria are killed within half an hour by a temperature of 140° F. The spores are able to withstand much higher temperatures, but even they are killed by boiling water (212° F.) within a few minutes. For some bacteria, known as thermophilic bacteria, the optimum temperature is 158° F. and to their action is due the heating of manure and hay. Intense cold does not destroy bacteria, but merely suspends their activity, which is once more restored when they are placed at their optimum temperature.

Aërobes and Anaërobes.—Some bacteria will only grow in the presence of free oxygen, and these are called *obligate aërobes*, others only grow in an atmosphere from which free oxygen is rigidly excluded and these are called *obligate anaërobes*. Others, while preferring the presence of oxygen, will nevertheless grow in its absence, and are called *facultative anaërobes*, while those which prefer an atmosphere free of oxygen, but will grow in its presence, are termed *facultative aërobes*.

Light, especially ultra-violet light, quickly kills bacteria, and incubators used for growing bacteria are kept dark. Pressure, no matter how great, has little effect on bacteria, owing to their extreme smallness.

Enzymes.—Bacteria are able to digest various food substances because they possess chemical agents known as *ferments* or *enzymes*. The exact chemical nature of an enzyme is unknown.

Putrefaction.—When protein matter is broken down by enzyme action the process is known as putrefaction. We are all familiar with the sight and smell of sour milk and bad meat, and it can be proved that the badness is due to bacteria, because food can be kept unchanged indefinitely if they are rigidly excluded from it. The enzymes responsible for putrefaction resemble the proteolytic ferments known as pepsin and trypsin, which are found in the stomach and intestine of man and animals. As a result of putrefaction the complex protein molecule is split into much simpler substances, such as polypeptides, creatinin, and indole. At the same time, gases, such as hydrogen sulphide, mercaptans, marsh gas, carbon dioxide, ammonia, and hydrogen, some of which are foul-smelling, are given off. Some of the products of putrefaction are poisonous and are called *ptomaines*; these are supposed to cause the illness known as ptomaine poisoning, which is probably rare, as few people would eat food so putrid as to contain them.

Fermentation.—The splitting of carbohydrate substances, which include starch and sugars, and alcohols, by bacteria is called *fermentation*, which shows itself by frothing of the fermenting liquid due to the formation and escape of gas. The process is due to enzymes which possess various names depending on the particular substances upon which each acts. Thus maltase acts on maltose, lactase on lactose, amylase on starch, etc.

The most important fermentations are the following:

(1) Alcoholic fermentation—the conversion of glucose, by the action of yeast or the enzyme extracted from it, into alcohol and carbon dioxide.

(2) Lactic acid fermentation—the conversion of sugar into lactic acid.

(3) Butyric acid fermentation—the conversion of sugar mainly by anaërobic bacteria into butyric acid.

(4) Acetic acid fermentation—the conversion of alcohol into vinegar, which is acetic acid.

Another group of enzymes are able to split fats and these are called lipases.

Pigments.—Numerous organisms, known as chromogenic bacteria, are able to produce various coloured pigments, the most common colours being red, yellow, blue, and purple. Another group of organisms, particularly those living in sea water, are phosphorescent, and to them is due the phosphorescence seen in decomposing fish.

Poisonous Products.—The reason why bacteria cause disease when they infect a host is because many of the products of their metabolism are poisonous. Amongst these products we may mention the following:

(1) *Decomposition products.*—These are poisonous substances, which include the ptomaines, derived from the breaking down of protein matter upon which the bacteria are feeding.

(2) *Toxins.*—These are poisonous substances manufactured by certain bacteria and excreted by them into the surrounding medium. Each type of organism produces its own special toxin, which is therefore said to be specific for that organism. Thus diphtheria toxin is only produced by diphtheria bacilli, and tetanus toxin only by tetanus bacilli.

(3) *Endotoxins.*—These are poisonous substances formed by the organism, but retained within the bacterial cell during its life; they only become effective on the death and solution of the organism. These poisons are also specific, each type of bacteria only producing its own special endotoxin.

(4) *Bacterial proteins.*—These are the protein substances of which the bacterial cell is composed. They are not specific as they are much the same for all types of bacteria, and act as poisons only on the death and digestion of the bacteria.

Distribution.—Bacteria are widely distributed in nature and the following list gives some indication of their omnipresence.

(1) Suspended in the air of cities on small particles of dust and moisture, although the air at high altitudes, as on the tops of mountains, is free of bacteria; if the air of a room is kept absolutely still the dust will settle and eventually the air will become germ free.

(2) In the water of rivers, streams, and ponds and the shallow parts of the sea, but sea water taken from mid-ocean is free of them.

(3) Numerous varieties are present in soil and countless myriads in sewage.

(4) The skin surfaces, the mucous membranes of the alimentary tract from mouth to anus, of the upper respiratory tract and of the external genitalia, and the external auditory meatus all harbour numerous organisms.

Sterilization.—In order to study bacteria we have to grow each type in a pure state on special food substances, known as culture media, but before we can do this we have to render our apparatus and materials free of contaminating germs, and we call this process sterilization. Our apparatus will consist mainly of glass bottles, test tubes, and flat glass dishes provided with covers, known as Petri dishes.

The following are the chief methods of sterilization employed:

(1) Flaming. The flame of a Bunsen burner is used to heat some metal instruments and glassware.

(2) Hot air. Chiefly used for sterilizing glassware, which is heated in an oven to 320° F. for half an hour.

(3) Steam. Used to sterilize culture media, the vessels containing it being placed on a shelf in a chamber in which water is boiled. The vessels are surrounded by steam which raises them to a temperature of 212° F. In this method we often employ what is known as *intermittent sterilization*, which is carried out by giving the culture media a steaming of ten minutes on three successive days, the idea being that any bacteria which are not killed by the first heating will be by the subsequent ones.

(4) Steam under pressure. An apparatus called an autoclave is used to generate steam which is allowed to escape by means of a valve after a set pressure has been reached. Temperatures from 240°–250° F. are those generally employed, and the method is used for much the same purposes as the foregoing method as well as for destroying discarded cultures, one exposure for 15 minutes at these temperatures being sufficient to kill bacteria and spores.

(5) Simply boiling a liquid for a sufficient time will render it sterile.

(6) Filtration. Used to sterilize liquids which deteriorate when heated. The liquid is allowed to percolate through porous earthenware candles, which have pores so small that they retain all bacteria, except those which are known as filter passers or viruses, which we may ignore as they do not ordinarily contaminate our materials.

To prevent dust gaining access to our sterile vessels and culture media we plug the necks of bottles and test tubes with cotton wool, or use rubber corks or screw caps.

Culture Media.—With a few exceptions, the basis of all culture media is nutrient broth, which is prepared by extracting minced meat with boiling water and filtering off the fluid part and then adding to it peptone and salt. Nutrient broth may be used as it is or may be solidified by the addition of gelatine or agar-agar, a carbohydrate substance obtained from a Japanese seaweed. Gelatine has the disadvantage that it melts above 68° F., whereas agar-agar remains solid up to 113° F. and is therefore suitable for growing organisms whose optimum temperature is 98° F. Other culture media in addition to nutrient broth contain blood, blood serum, and various sugars. The sugar-containing media are used for fermentation purposes and have added to them chemicals, called indicators, which change colour according to whether an acid or alkaline reaction is produced. Examples of indicators are litmus, which is red in acid and blue in alkaline solutions, and phenolphthalein, which is colourless when acid and red when alkaline.

Cultivation.—Culture media are inoculated by means of swabs or a platinum wire held in a holder. The platinum wire is heated red hot in a flame, allowed to cool, then dipped in the infected material and withdrawn; a small amount of the material adheres to the wire, and is either emulsified in fluid media or rubbed on the surface of solid media, after which the wire is sterilized by the flame. The culture is put in an incubator for 12–18 hours to allow growth to occur, and is then ready to be examined. On solid media wherever an organism settles on the surface, it grows as a *colony*, which contains millions of individual bacteria. Each colony is usually a pure growth of one particular organism. Colonies of different species often show characteristic appearances; they may be coloured, transparent, or opaque, have regular or irregular edges, be dome-shaped, flat, or have a depressed centre, etc. On blood media certain organisms produce around each colony a clear zone due to destruction of the red blood corpuscles and their haemoglobin. In fluid media the growth may produce general turbidity, a flocculent deposit, or a pellicle on the surface. Certain media, called *selective media*, enhance the growth of a certain type of bacteria, for example, coagulated serum is used to grow diphtheria bacilli. For anaërobic cultivation special apparatus is required to produce an atmosphere free of oxygen.

Staining Reactions.—After noting the characteristics of the colony, the organism may be further examined in a dead state, by making a film of it on a glass slide and staining it with various aniline dyes, which render the outline and structure of the organisms more visible under the microscope. One of the most useful staining processes is that known as the *Gram method*, which consists of first staining with a violet dye, such as gentian violet, for one to two minutes, treating with iodine solution, and then washing with alcohol until no more dye is washed out, and then counterstaining with a red dye, such as neutral red or weak carbon fuchsin for one to two minutes. By this method organisms are divided into two groups, as it will be found that some organisms are able to retain the violet stain after being treated with alcohol, whilst others are decolorized by the alcohol and are stained red by the counterstain. The organisms which retain the violet stain are called *Gram positive*, and those which are decolorized are called *Gram negative*.

Two important special staining processes are *Neisser's method* for diphtheria bacilli and *Ziehl-Neelsen's method* for tubercle bacilli.

Neisser's method consists of applying first a blue stain, acid methylene blue, for half a minute, washing this off, and counterstaining with a solution of Bismarck brown for one minute. By this method diphtheria bacilli show the body of the organism stained brown with a blue dot at either end, the so-called polar bodies, while other organisms are stained a uniform brown.

In Ziehl-Neelsen's method a solution of carbol fuchsin is added and warmed until steam rises, but without boiling, for five minutes, the stain is then washed off with water and the film placed in 25 per cent sulphuric acid for several minutes and again washed in water. If it is still pink it is put back in the acid, and then again washed, and the process repeated until the film no longer shows any colour. It is then counterstained with methylene blue for half a minute. By this method tubercle bacilli are stained red and other organisms, if present, will be blue, as the acid treatment will remove the red stain from all organisms other than tubercle bacilli and their allies, known as *acid-fast bacilli.* Special staining processes are used to demonstrate spores, capsules, and flagella.

Living organisms may be examined with the microscope in two ways, by a *hanging drop preparation*, and by *dark ground illumination.* The hanging drop is prepared by placing a drop from a fluid culture on a cover slip and inverting this on a special slide having a depression so that the drop hangs in the hollow. This preparation is chiefly used to determine whether the organism is motile or nonmotile. In dark ground illumination special attachments are required for the microscope whereby all central light is cut out and light diffuses in only from the sides, and this striking on the organism causes it to be illuminated and appear as a bright object on a black background. This method is chiefly used for examining spirochaetes and viruses.

A final study of the organism may be the injection of a fluid culture of it into an animal and noting the effects produced, e.g. whether it is lethal or harmless, whether it produces abscesses, etc.

We may summarize the steps necessary in the identification of an organism as follows:

(1) Appearance of the colony on various media.
(2) Whether aërobic or anaërobic.
(3) Range of temperature over which it grows.
(4) Production of pigment.
(5) Staining reactions.

(6) Shape and size.
(7) Whether motile or not.
(If motile, the number and position of flagella.)
(8) Whether it forms spores and, if so, their position.
(9) Fermentation reactions and other effects on various media.
(10) Agglutination reactions (to be considered later).
(11) Animal inoculation.

Infection.—By the term infection is meant the invasion of the living tissues by living micro-organisms, which grow and multiply at the expense of the host; the disease so produced is termed an infective disease, and is usually transmissible by inoculation. The micro-organisms producing diseases are called *pathogenic,* whilst those which exist as harmless saprophytes are called *non-pathogenic,* but these terms are only relative and depend on the virulence and dose of the infecting organism, for if an enormous dose of an ordinarily harmless organism is given it may give rise to a harmful disease, whereas in a smaller dose no trouble would have resulted. If the infecting organism is discharged from the host in the excretions, secretions, or other material, it may infect another individual, and according to whether it infects from a distance or only by direct contact, the disease produced is termed respectively infectious or contagious. The material which conveys the infection is known as the contagion or the virus. Measles is an infectious disease, ringworm a contagious disease, whilst malaria is infective only since it is conveyed by inoculation, but does not of itself infect individuals.

The infecting agent may enter the body (1) by the gastro-intestinal tract, e.g. typhoid fever; (2) by the respiratory tract, e.g. pneumonia; (3) by inoculation of the skin surfaces or mucous membranes, e.g. streptococcal infections. Sometimes infection depends on the presence of an intermediary host, such as the mosquito in malaria and yellow fever.

Infection may be *local* or *general.* In a local infection the organism remains at the site of the inoculation, and the main harmful effect is produced in that situation, as in a boil. If after inoculation the organism gains entrance to the blood stream and there grows and multiplies we have the condition known as *bacteriaemia, septicaemia,* or *general infection. Pyaemia* is a special form of septicaemia in which multiple abscesses occur in the organs due to the lodgment in them of infected emboli (p. 577).

The absorption of toxic substances from a local site giving rise to general symptoms, is known as *intoxication* or *toxaemia,* for example, in diphtheria the diphtheria bacilli remain localized in the mucous membrane of the throat and there produce toxin which is absorbed and affects the whole body.

As the result of an infection the body responds by a general reaction characterized by fever, changes in metabolism, and the development of chemical substances known as antibodies in the body fluids and tissues, whereby an immunity or insusceptibility to the infecting agent is acquired.

The substances which cause the production of antibodies are known as *antigens* and are in the main of protein nature. Blood serum containing antibody is called an *immune serum* or *antiserum*. Various interactions may occur between antibody and antigen and are called immunity reactions, but these reactions are extremely specific, and only take place between the antibody and the antigen which caused its production. When a reaction occurs we say that antigen and antibody are homologous (similar). As a general rule an animal will only form an antibody when the antigen is injected into its tissues, and not by absorption from the alimentary canal, and when the antigen is composed of a substance foreign to its own tissues (p. 305).

Antibodies.—The following are the most important antibodies:

(1) **Antitoxin.**—As the result of absorption of toxin the body responds by forming a substance called antitoxin, which is able to unite with the toxin and render it harmless, but the reaction is absolutely specific, thus diphtheria toxin only unites with diphtheria antitoxin, and tetanus toxin only with tetanus antitoxin. Serum containing antitoxin is called an *antitoxic serum*, and is prepared commercially by injecting a horse with gradually increasing doses of toxin until its blood contains a large amount of antitoxin; it is then bled and the resulting serum collected for use in the treatment of the appropriate disease.

(2) **Antibacterial Antibodies** are formed when bacteria are injected and may be divided into the following:

(*a*) *Bacteriolysin* which causes the bacteria to dissolve or lyse as it is termed. A serum containing bacteriolysin is called a *bacteriolytic serum*.

(*b*) *Agglutinin* which causes the bacteria to become clumped together, and if motile, to lose their motility. Serum containing agglutinin is called an *agglutinating serum*, and is very important, as it only agglutinates its own specific organism and can for this reason be used to identify an unknown organism, for if agglutination occurs we can be sure that it is the same type of organism as that which caused the formation of the agglutinin in our known serum.

(*c*) *Opsonin.*—This antibody appears to render the bacteria attractive to the white blood corpuscles so that they are easily ingested or phagocytosed by them.

(3) **Haemolysin** is formed when red blood corpuscles of one species of animal are injected into an animal of a different species. It has the power of causing lysis of the homologous red cells and setting free their contained haemoglobin. In the same way cytolysins may be formed by injecting cells of organs, such as kidney or liver, and these are able to dissolve the homologous cells.

(4) **Precipitin.**—If a protein, such as egg-white, is injected an antibody is formed, such that when mixed with the specific protein it will form a precipitate with it, and this reaction can be used to identify an unknown protein. (See also p. 306.)

Bacteriolysis, haemolysis, and opsonic effect are complicated reactions and require two stages for their completion. In bacteriolysis the immune serum containing the specific antibody first unites with the antigen, the bacteria, but the actual lysis is performed by a non-specific substance called 'complement,' which is present in all fresh serum, no matter what its source, but varying in amount in different sera.

Antiserum containing complement is said to be 'active,' and one that does not 'inactive,' but the inactive serum can be made active by the addition of fresh serum. Complement is rapidly lost from serum by keeping or heating to 132° F., whereas antibody is stable and not destroyed by these means.

Complement is not required for either agglutination or the union of toxin with antitoxin.

Immunity.—Immunity to infectious diseases is generally described under two heads, namely, *Natural* and *Acquired*.

Natural Immunity.—All living animals are constantly exposed to the risk of infection from the air they breathe, from the food they eat, and from wounds, whether external or internal, and if they possessed no protective mechanism would quickly succumb to an invasion of their tissues by micro-organisms. This inborn ability of the animal body to protect itself from noxious substances is called natural immunity and is exhibited against both living bacteria and their toxins. The protection afforded by it varies amongst individuals and races. Man is naturally immune to many diseases of the lower animals and vice versa. A certain disease may be common in one species of animal and almost unknown in an allied type, thus mice are very susceptible to anthrax, while rats are unharmed by it; pigs and cows are often subjects of tuberculosis, whereas goats and horses are only rarely attacked by it. Chickens are practically immune to tetanus toxin. Individuals although repeatedly exposed to an infection may escape it altogether, while others suffer from it with varying degrees of severity. Children are generally more susceptible than adults. A community constantly in contact with a certain disease tends to become immune, thus negroes are generally unharmed by yellow fever which attacks the whites; and measles, although not very fatal to white races, nearly decimated the population of some of the South Sea Islands when first introduced by white settlers. Natural immunity is hardly ever absolute, and may be broken down by an excessive dose or by extreme virulence of the infecting organism, or by keeping the animal in unfavourable conditions such as cold and damp quarters, or by starving or bleeding it. The virulence of an organism may be greatly increased by successive transfers through a susceptible animal, and this process is called ' passage.'

Certain tissues exhibit a *local immunity*, for instance, the skin surfaces are resistant to the organisms ordinarily present on them, and wounds of the mouth and rectum generally heal without becoming infected.

Acquired Immunity is divided into two types called active and passive. (See also p. 317.)

Active Acquired Immunity.—As the result of an attack of an acute infective disease, our tissues respond by forming antibodies which not only combat the disease but afterwards, in many instances, remain in our blood during health for a considerable time and ward off a second attack of the same disease. Every one is familiar with the fact that second attacks of measles, diphtheria, chickenpox, etc., are comparatively rare, the original attack having conferred an acquired immunity against reinfection. This kind of immunity is called active because the tissues of the infected animal are responsible for the production of the defensive antibodies.

Active immunity may be artificially induced in a healthy animal by the following means:

(1) Inoculation of living virulent organisms in doses sufficiently small so as not to give rise to a serious illness. This is a dangerous method as it is difficult to control the dosage and virulence of the organism.

(2) Inoculation of living organisms whose virulence has been decreased by growing under unfavourable conditions, such as an elevated temperature or by passage through a non-susceptible animal. The organism so treated is said to be attenuated.

(3) Injection of dead bacteria.

(4) Injection of gradually increasing doses of toxin, as used commercially for the production of antitoxic sera. This method is used in the human subject to obtain immunity against diphtheria by the injection of a small quantity of a modified toxin.

Passive Immunity.—This is produced in one animal by injecting into it the serum of another animal which has been highly immunized by one of the methods described under active immunity. In this form of immunity the tissues of the infected animal are entirely passive and make no effort to combat the infection; the harmful agent is neutralized by the antibodies in the injected serum, which may be either antitoxic or antibacterial.

The following differences may be noted with regard to the immunity produced by active or passive means. Active immunity takes a few days to become established, but once established lasts at least for several months or years, or for life, and the amount of antibody formed generally greatly exceeds that merely required to neutralize the infective agent. Passive immunity, on the other hand, begins immediately on the injection of the antiserum, but only lasts for a short time, and its effect is strictly proportional to the quantity of injected antibody, a severe injection requiring a larger dose than a mild one, quite irrespective of age, since a child may be injected with a much more virulent organism than an adult, or vice versa. Both these methods of immunization may be used either therapeutically, that is, to cure an established infection, or prophylactically, that is, to prevent a healthy person from becoming infected when exposed to the risk of infection. A very common method employed for this purpose is a suspension of killed organisms called a *vaccine*, which may be injected either subcutaneously or intramuscularly. The vaccine is prepared by making cultures of the organisms to be used, emulsifying these in normal saline, estimating the strength and standardizing so that it contains so many million organisms per c.c. and then killing by heat at 140° F. for half an hour. Before use it is cultured to see that the organisms have been killed. The vaccine is called *autogenous* when the organisms used in its preparation are obtained from material supplied by the patient, and *stock* when obtained from other sources; it may consist of a single type or of several different kinds of bacteria mixed together.

In a therapeutic vaccine the same organism as that causing the infection is used and is injected into a healthy site, with the idea of inducing the healthy tissues to produce antibodies, which will be carried in the blood stream to the affected areas, where the tissues have been so damaged as to render them incapable of producing the necessary antibody. As a rule, 6–12 injections of gradually increasing dosage are given at weekly intervals.

Prophylactic vaccines are made up of the organisms against which immunity is desired and usually only two inoculations at a week's interval are given. Conspicuous success against typhoid infection has been obtained during the last two wars by the use of antityphoid vaccination.

Another defensive mechanism possessed by the body is exhibited in the so-called septic diseases in which an exudate of blood plasma and leucocytes occurs and this may lead to ***suppuration*** which is characterized by the presence of pus in the tissues as the result of an infection by certain micro-organisms, particularly staphylococci and streptococci, and less frequently pneumococci and Bacillus coli, and, in very dirty wounds, anaërobic bacilli. Pus is a thick creamy fluid consisting mainly of dead with some living leucocytes, particularly of the polymorphonuclear variety, which, having escaped from the blood-vessels at the site of the infection, attack the bacteria by ingesting them, called *phagocytosis*, and destroying them by enzymes. The leucocytes are formed in the bone-marrow, which is stimulated by the infection to greatly increase the supply, and this increase is called a leucocytosis. An example of suppuration is an ***abscess***, which may be defined as a circumscribed cavity containing pus occurring in any organ of the body. An abscess of the skin is called a ***boil*** and is often the result of infection of a hair follicle by staphylococci. (See also p. 569.)

Fever.—The general response of the body to an infection is known as ' fever ' which is manifested by a raised temperature or pyrexia, accelerated pulse and respiration rate, diminished secretion of saliva and sweat with consequent dry mouth and skin, loss of appetite and small intake of food and drink resulting in constipation and small volume of concentrated and highly coloured urine, together with mental depression, restlessness, and delirium. The pyrexia is probably a defensive mechanism as it is thought that the body can deal more effectively with the infecting organism when the temperature is raised. The temperature of the body is controlled by a centre in the brain which maintains a balance between heat production and heat loss. In fever the temperature is adjusted at a higher level by increased heat production and diminished heat loss. (See also p. 191.)

Disinfection.—Finally, it is necessary to discuss briefly disinfection, which implies the destruction or removal of infective properties by the killing or exclusion of micro-organisms. The following are the common methods used for attaining this. (See also p. 46.)

(1) *Heat.*—(*a*) When an article is no longer required it may be burnt. Fire is the simplest and most efficient of all methods. (*b*) Dry heat may be used for small articles, but is unsuitable for bedding or woollens as these are damaged by the temperature necessary for sterilization. (*c*) Boiling for a few minutes is suitable

for metal and china ware. (*d*) Steam under pressure can be used for most articles with the exception of leather.

(2) *Light.*—Sunlight and artificial ultra-violet light are excellent disinfectants, but possess no power of penetration.

(3) *Desiccation,* that is drying, is chiefly used to preserve foodstuffs.

(4) *Filtration* is used for sterilizing fluids.

(5) *Chemical disinfectants.*—A great variety of substances possess the power of destroying or preventing the growth of bacteria and are classified accordingly into: (*a*) Germicides which kill bacteria; (*b*) antiseptics which, by inhibiting the growth of bacteria, but not necessarily killing them, prevent sepsis and putrefaction. (*c*) deodorants which destroy or absorb foul-smelling gases given off during putrefaction and similar processes.

An efficient disinfectant should not decompose at reasonable temperatures and must be soluble in water, forming a stable and uniform emulsion; it must be stable in the presence of organic matter, possess a high solvent power for grease; be relatively cheap, and have no action on metals. It must not be destructive to or stain fabrics, nor be caustic.

CHEMOTHERAPY.—For many years doctors and chemists have been searching for substances which, while being harmless to the human body, will destroy the parasites infecting it. Quinine is such a substance, for it is lethal to the malarial parasite, but is relatively harmless to the patient. In his search for the magic bullet which would kill the spirochaete of syphilis Ehrlich tested no fewer than 606 arsenical compounds before he found Salvarsan with the required properties. Following this discovery research was continued until 1935 when Domagk, using a dye called prontosil, found that it would free the blood stream of haemolytic streptococci. The active substance in prontosil is sulphonamide, and chemists have rapidly prepared other sulphonamide compounds, such as sulphanilamide, sulphapyridine, sulphathiazole, and sulphadiazine, etc., each in succession being more potent than the one before. These drugs can be given either by mouth or by injection, and are active against haemolytic streptococci, pneumococci, meningococci, gonococci, B. coli and to some extent against B. welchii and staphylococci. Another drug, sulphaguanidine, is useful in the treatment of bacillary dysentery. All the sulphonamide drugs act by stopping the division and multiplication of the bacteria and this action is known as *bacteriostasis*: they are relatively harmless to human beings, except for a few who are sensitive, and in whom serious toxic effects, such as excessive vomiting, rashes, haematuria, and agranulocytosis, may occur (see p. 776).

Another chemotherapeutic substance which has become available is *penicillin.* Its mode of action, namely, bacteriostasis, is similar to that of the sulphonamide drugs, but it is a totally different substance as it is an excretion of a mould called penicillium notatum. When this mould is grown in a simple chemical medium containing sugar, it excretes a yellow fluid with an acid reaction which is called penicillin, which is very unstable, and quickly becomes inactive, but, if turned into the calcium or sodium salt and dried, it retains its potency indefinitely. The organisms susceptible to the action of penicillin are streptococci, staphylococci, pneumococci, the diphtheria bacilli, the bacilli of gas gangrene, gonococci, and meningococci, and also the spirochaetes of syphilis, relapsing fever, and Weil's disease. Unfortunately, it is inactive against Gram negative bacilli, and is indeed destroyed by them. It may be used for external application as crude penicillin, and even the mould itself may be applied to wounds, but for intramuscular and intravenous injection the purified calcium and sodium salts must be used. Penicillin is rapidly absorbed and carried in the blood stream to all parts of the body, and is quickly excreted unchanged by the kidney. It cannot be given by the rectum, as the organisms there destroy it. It is not excreted from the blood stream into the cerebrospinal fluid, nor into either the pleural or joint cavities, but can be put into any of them by injection. Purified penicillin is devoid of any harmful effects other than pain and smarting when applied to wounds or on injection. It can be used in conjection with sulphonamide drugs, and indeed the combination seems to enhance their action.

The manufactured product, a dry yellow powder consisting of the calcium or sodium salt of penicillin, is supplied in sealed ampoules which should be stored in an ice chest to prevent deterioration. Both these salts are readily soluble in either water or saline, but as the solutions rapidly lose strength only enough should be made up for immediate use.

Penicillin is administered either systemically or locally.

Systemic treatment is either by intravenous or intramuscular injection. The intravenous injection is given by continuous drip over a period of twenty-four hours by dissolving 100,000–200,000 units of penicillin in a sufficiency of saline or glucose saline; this daily dose is repeated for as long as necessary.

For intramuscular injection 10,000–20,000 units of penicillin dissolved in 1–2 c.c. of sterile water is given into the outer side of the thigh every 3–4 hours for as long as necessary, omitting one dose at night to provide for a reasonable period of sleep. Since both the penicillin and the multiple pricks are painful, it is usual to mix ½–1 c.c. of two per cent procaine with each dose. A preparation which is being tried is 100,000–200,000 units of penicillin suspended in 1 c.c. of oil and beeswax injected intramuscularly, with the object of giving a prolonged period of absorption and thus necessitating only one or two injections in the twenty-four hours.

To give penicillin by mouth is wasteful as only ⅕–⅛ of the dose is absorbed into the blood stream, the rest being destroyed by the acid of the stomach. It can be used in this way for infants under one year of age, in whom gastric acidity is low, by giving 10,000–100,000 units in each feed.

Local treatment.—Penicillin of a strength of 1,000–5,000 units per 1 c.c. may be injected into wounds, into abscess cavities after aspiration of the pus, or into the vagina.

A cream containing 1,000 units of penicillin per 1 gm. can be spread over or incorporated in gauze for application to wounds and burns. A similar ointment can be used for eye infections or skin diseases. A powder consisting of 5,000 units of penicillin mixed with 1 gm. of sulphathiazole can be dusted over wounds by means of a blower. Lozenges containing 500 units of penicillin can be sucked in mouth and throat infections. Finally a very fine mist of penicillin known as an *aerosol* may be sprayed into the air around cases of asthma, bronchitis, and bronchiectasis so that on inhalation it can be carried into the finest bronchioles and there kill the infecting organisms. It is very necessary to keep all preparations of penicillin from becoming contaminated with bacteria, especially Gram negative bacilli, since these manufacture a ferment known as *penicillinase* which quickly destroys the penicillin.

The above doses of penicillin are those commonly used but much larger doses can be given in special cases.

D.D.T.—Another substance which has come into prominence lately is a powder called D.D.T. (Dichlordiphenyltrichlorethane), which, by killing lice and other insects, will give protection against them. In war typhus fever, the germ of which is carried by lice, is always a menace and may occur anywhere, as witness the recent outbreak in Naples; therefore the control of louse infestation becomes extremely important. By impregnating the underclothing with D.D.T. freedom from external parasites can be assured for at least 3 weeks. It is also effective when blown up the sleeves and down the necks of dressed persons. It has no harmful action on the human skin, and no objectionable odour; clothing is undamaged and it is not easily removed by laundering. It is undoubtedly the most effective agent that has so far been used to prevent louse infestation.

APPENDIX

TABLES OF WEIGHTS AND MEASURES

Domestic Measure

1 Drop	=	1 Minim (approximately)
1 Teaspoonful	=	1 Drachm
1 Dessertspoonful	=	2 Drachms
1 Tablespoonful	=	4 Drachms
1 Wineglassful	=	2 Fluid Ounces

N.B.—The domestic measures are not sufficiently accurate to be used when measuring drugs.

Apothecaries' Weight

			Symbol
20 Grains	=	1 Scruple	(℈)
60 Grains	=	1 Drachm	(ʒ)
480 Grains	=	1 Ounce	(℥)

Apothecaries' Fluid Measure

			Symbol
Minim			(♏)
60 Minims	=	1 Drachm	(ʒ)
8 Drachms	=	1 Ounce	(℥)
20 Ounces	=	1 Pint	(O)
8 Pints	=	1 Gallon	(C)

THE METRIC SYSTEM

The initial unit of the Metric System is the Metre, or unit of length, which was intended to represent one ten-millionth part of the earth's quadrant, or one forty-millionth part of the circumference of the earth around the poles. The multiples and subdivisions of this and all the other units are obtained by the use of decimals, and for this reason the system is known as the decimal system.

The multiples are designated by the Greek prefixes, deka = 10; hecto = 100; kilo = 1,000; myria = 10,000. For the subdivisions, Latin prefixes are employed: deci = $\frac{1}{10}$; centi = $\frac{1}{100}$; milli = $\frac{1}{1000}$. Thus, for measures of length we have the following expressions, showing the abbreviations employed and the equivalent in the Imperial standards of measurements:

1 Myriametre	Mm.	=	10,000·0	M.	=	6·2137	Miles
1 Kilometre	Km.	=	1,000·0	M.	=	0·6214	Mile
1 Hectometre	Hm.	=	100·0	M.	=	109·361	Yards
1 Dekametre	Dm.	=	10·0	M.	=	32·8084	Feet
1 Metre	M.	=	1·0	M.	=	39·3701	Inches
1 Decimetre	dm.	=	0·1	M.	=	3·937	,,
1 Centimetre	cm.	=	0·01	M.	=	0·3937	Inch
1 Millimetre	mm.	=	0·001	M.	=	0·0394	,,
1 Micron	μ	=	0·000001	M.	=	0·000039	,,

The unit of mass in the metric system is the Gramme. This was derived from the metre and represented the weight on one cubic centimetre of water, or the quantity of distilled water, at its maximum density, 4° C. (39·2° F.), which would fill the cube of one-hundredth part of a metre. The relative value of the gramme, together with its multiples and subdivisions, as compared with the Imperial standards of weight, may be seen from the following table:

1 Myriagram	Mgm.	=	10,000·0	Gm.	=	22·0461	Pounds
1 Kilogram	Kgm.	=	1,000·0	,,	=	2·2046	,,
1 Hectogram	Hgm	=	100·0	,,	=	3·5274	Ounces avoir.
1 Dekagram	Dgm.	=	10·0	,,	=	154·3236	Grains
1 Gramme	Gm.	=	1·0	,,	=	15·4324	,,
1 Decigram	dgm.	=	0·1	,,	=	1·5432	,,
1 Centigram	cgm.	=	0·01	,,	=	0·1543	Grain
1 Milligram	mgm.	=	0·001	,,	=	0·0154	,,

From the unit of mass (the gramme) is derived the unit of the measure of capacity, or Litre. The multiples and subdivisions of the litre, with their corresponding equivalents in Imperial fluid measure, are:

1 Myrialitre	Ml.	=	10,000·0	L.	=	2,199·76	Imperial gallons
1 Kilolitre	Kl.	=	1,000·0	,,	=	219·976	,, ,,
1 Hectolitre	Hl	=	100·0	,,	=	21·9976	,, ,,
1 Dekalitre	Dl.	=	10·0	,,	=	2·1998	,, ,,
1 Litre	L.	=	1·0	,,	=	35·196	Imperial fluid ounces
1 Decilitre	dl.	=	0·1	,,	=	3·5196	,, ,, ,,
1 Centilitre	cl.	=	0·01	,,	=	0·352	Imperial fluid ounce
1 Millilitre (Mil)	ml.	=	0·001	,,	=	0·0352	,, ,, ,,
1 Decimil	dml.	=	0·0001	,,	=	1·689	Imperial minims
1 Centimil	cml.	=	0·00001	,,	=	0·169	Imperial minim

The ordinary medical unit in the liquid measure is the millilitre (mil). For all ordinary purposes of calculation, the cubic centimetre (c.c.) may be taken as equivalent to the millilitre. These are the smallest measures of capacity commonly used. The term millilitre (mil) is now the "official" unit of capacity although the term cubic centimetre (c.c.) is still commonly employed in practice.

The measures of the metric system in most common use and their signs are as follows:

The Metre .	**M.**
Centimetre .	**cm.**
Millimetre .	**mm.**
Litre . .	**L.**
Millilitre . .	**mil**
Cubic Centimetre	**c.c.**
Gramme . .	**gm.**
Kilogram . .	**K.**

APPROXIMATE VALUES OF METRIC MEASURES

Measures.—Imperial to Metric

Minims	C.c.	Minims	C.c.	Fluid Oz.	C.c.
½ =	0·03	15 =	1·0	1 =	30·0
1 =	0·06	20 =	1·2	2 =	60·0
2 =	0·12	25 =	1·5	4 =	115·0
3 =	0·2	30 =	2·0	5 =	140·0
4 =	0·25	40 =	2·5	6 =	170·0
5 =	0·30	45 =	3·0	8 =	230.0
6 =	0·4	60 =	4·0	10 =	280·0
8 =	0·5	90 =	6·0	20 =	568·0
10 =	0·6	120 =	8·0	gallon.	litres.
12 =	0·8	240 =	15·0	1 =	4·536

Measures.—Metric to Imperial

1 C.c. . . . = 15 (nearer 17) minims
1 Litre . . . = 1 pint, 15 fl. oz. (approx.)

Measures of Length

1 Millimetre . . . = 0·039370 inch
1 Centimetre . . . = 0·3937 „
1 Decimetre . . . = 3·937 inches
1 Metre . . . . = 39·370113 inches, or 1 yard 3·37 inches (nearly)

Weights.—Imperial to Metric

Grain	Gm.	Grains	Gm.	Grains	Gm.
1/1000 =	0·000065	⅕ =	0·012	12 =	0·8
1/200 =	0·0003	¼ =	0·016	15 =	1·0
1/100 =	0·0006	⅓ =	0·02	20 =	1·2
1/64 =	0·001	½ =	0·03	30 =	2·0
1/50 =	0·0013	¾ =	0·05	45 =	3·0
1/40 =	0·0015	1 =	0·06	60 =	4·0
1/32 =	0·002	1½ =	0·1	90 =	6·0
1/25 =	0·0025	2 =	0·12	120 =	8·0
1/20 =	0·003	3 =	0·2	150 =	10·0
1/16 =	0·004	4 =	0·25	180 =	12·0
1/12 =	0·005	5 =	0·3	½ oz. (av.) =	15·0
1/10 =	0·006	6 =	0·4	1 „ =	30·0
⅛ =	0·008	8 =	0·5	1 pound =	453·59
⅙ =	0·01	10 =	0·6		

Weights.—Metric to Imperial

1 Kilogram . . . = 2 lb. 3¼ oz.
500 Gm. . . . . = 1 lb. 1 oz.
100 Gm. . . . . = 3½ oz.
25 Gm. . . . . = ⅞ oz.
10 Gm. . . . . = ⅓ oz.
1 Gm. . . . . = 15·43 grains
½ Gm. or 500 Milligrams . = 7·7 grains

TABLE OF HYPODERMIC INJECTIONS

Name of Injection	Strength of Hypodermic Solution, Tablets, and Sterules	Dose of Hypodermic Solution	Chief Effect of the Drug
1. Liquor Adrenalin Hydrochlor.	1–1000, or more dilute	Variable 1–5 ♏ or more	Stimulant, antispasmodic, haemostatic.
2. Inj. Atropinae Hypodermica	1% solution of Atrop. sulph. Hyp. tablets: $\frac{1}{200}$, $\frac{1}{150}$, $\frac{1}{100}$, and $\frac{1}{50}$ gr. in each Hyp. sterules: $\frac{1}{100}$ gr. in 8 ♏	1–3 ♏	Powerful stimulant especially to the respiratory centres.
3. Inj. Apomorphinae Hyp. B.P.	1% solution Hyp. tablets: $\frac{1}{20}$, $\frac{1}{15}$, and $\frac{1}{10}$ gr. in each Hyp. sterules: $\frac{1}{10}$ gr. in each	5–10 ♏	Swiftest and most powerful emetic, used when an immediate result is required provided the stomach is uninjured.
4. Inj. Cocaine Hyp. B.P.	5% solution Hyp. tablets: $\frac{1}{10}$, $\frac{1}{6}$, $\frac{1}{4}$, $\frac{1}{3}$, and $\frac{1}{2}$ gr. in each	5–10 ♏	Cardiac stimulant, used chiefly to induce local anaesthesia (p. 371).
5. Inj. Camphorae Hyp.	1–5 (of sterile olive oil)	5–10 ♏	Stimulant, acts chiefly on the nervous system
6. Inj. Digitalini Hyp.	1–500 solution	3–8 ♏	Cardiac stimulant.
7. Inj. Ergotae Hyp. B.P.	33% solution of Ergotin Hyp. sterules 10 ♏ of 33% solution in each	3–8 ♏	Excites uterine contraction, haemostatic.
8. *Ether	Undiluted	30–60 ♏	General stimulant.
9. Inj. Heroin Hydrochloridi	$\frac{1}{6}$ gr. in 5 ♏	2–5 ♏	Sedative, anodyne, narcotic.
10. Inj. Hyoscinae Hyp.	1 gr.–1000 ♏ Hyp. tablets: $\frac{1}{400}$, $\frac{1}{300}$, $\frac{1}{100}$, and $\frac{1}{75}$ gr. in each	5–10 ♏	Powerful hypnotic, cardiac and respiratory stimulant.
11. Inj. Morphinae Hyp. B.P.	2½% solution of Morphine tartrate Hyp. tablets: $\frac{1}{8}$, $\frac{1}{6}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, and 1 gr. in each Hyp. sterules: $\frac{1}{8}$, $\frac{1}{6}$, $\frac{1}{4}$, and $\frac{1}{2}$ gr. in each	5–10 ♏	Anodyne, hypnotic, haemostatic.
12. Inj. Morphinae et Atropinae Hyp.	contains Morphia tartrate $\frac{1}{6}$ gr. and Atropine sulphate $\frac{1}{80}$ gr. in 10 ♏ (K.C.H.P.) Hyp. tablets— Morphia: $\frac{1}{8}$, $\frac{1}{6}$, $\frac{1}{6}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{1}{2}$ gr. Atropine: $\frac{1}{200}$, $\frac{1}{150}$, $\frac{1}{120}$, $\frac{1}{200}$, $\frac{1}{120}$, $\frac{1}{120}$, $\frac{1}{100}$, $\frac{1}{80}$ gr.	2–10 ♏	See morphia, also atropine.
13. *Pituitary Extract (infundibular)	20% extract Hyp. sterules $\frac{1}{2}$–1 c.c.	$\frac{1}{2}$–1 c.c.	Raises the blood-pressure. Excites uterine contraction. Used in cases of severe shock.
14. Inj. Pilocarpinae Nitratis Hyp.	1–20 solution Hyp. tablets: $\frac{1}{10}$, $\frac{1}{8}$, $\frac{1}{6}$, $\frac{1}{4}$, $\frac{1}{3}$, and $\frac{1}{2}$ gr. in each Hyp. sterules: $\frac{1}{10}$, $\frac{1}{4}$, and $\frac{1}{2}$ gr. in each	2–6 ♏	Powerful diaphoretic.

TABLE OF HYPODERMIC INJECTIONS—*continued*

Name of Injection	Strength of Hypodermic Solution, Tablets, and Sterules	Dose of Hypodermic Solution	Chief Effect of the Drug
15. Inj. Strychninae Hyp. B.P.	½% solution Hyp. tablets: 1/100, 1/60, 1/30, and 1/16, gr. in each	5–10 ♏	Cardiac, respiratory and nerve stimulant.
16. *Brandy	Undiluted	10–30 ♏	General stimulant.
17. Normal saline solution (sterile)	Undiluted	℥iv–℥x	General stimulant, see subcutaneous infusion (p. 72).

N.B.—Drugs with an asterisk require to be injected deeply into muscle (see hypodermic injections, p. 72). All drugs prepared in solution for hypodermic use must be recently prepared, this is especially important in the case of ergot and morphia.

TABLE OF ANTISEPTIC SOLUTIONS

Drug	For Mucous Membranes, Wounds, etc.	External Application	Disinfection
1. Aniline dyes:			
Acriflavine	1–1,000—1–4,000	1–1,000	—
Brilliant green	1–1,000—1–2,000	1–200	—
Gentian violet	1–500—1–1,000	5%	—
Methylene blue	1–500	3–5%	—
2. Biniodide of mercury in spirit	—	1–500	1–500
3. Boric acid	1–50, or saturated solution	saturated solution (1–30)	useless
4. Carbolic acid	1–60—1–80	1–20—1–40	1–20
5. Chlorinated soda, B.P. solution	—	—	1–7
6. Chloride of zinc	1–10—1–20	1–10	—
7. Corrosive sublimate, or perchloride of mercury	1–4,000—1–10,000	1–1,000—1–2,000	1–500—1–1,000
8. Creolin	½–1%	2%	2–3%
9. Dettol	½–1%	4–8%	2½%
10. Eusol	1–4 to ½ strength	undiluted	—
11. Formalin	—	1–50	dry, for sterilizing catheters, etc.
12. Iodine	Tinct. Iod. ʒi–Oi water	2% (rectified spirit solution)	—
13. Iodoform emulsion	10%	—	—
14. Lysol	½–1%	1–2%	2–3%
15. Peroxide of hydrogen, volumes 10	1–2, or undiluted	—	—
16. Quinine	1%	—	—
17. Soda bicarbonate alkaline lotion	10 gr.– i	—	—
18. Sulphur emulsion	1–16	—	—
Sulphur bath (sulphurated potash)	—	ʒi–ʒii to a gallon of water	—

N.B.—For method of reckoning the amount of drug and diluent necessary when increasing or decreasing the strength of solutions, see p. 634.

COMMON ABBREVIATIONS USED IN PRESCRIPTION WRITING

Abbreviation	*Latin*	*English*
āā.	ana	of each (i.e. equal parts)
a.c.	ante cibum	before food
add.	adde	add
ad part. dolent.	ad partem dolentem	to the painful part
ad lib.	ad libitum	as much as desired
alt. die.	alternis diebus	alternate days
alt. hor.	alternis horis	alternate hours
alt. noct.	alternis noctibus	alternate nights
aq.	aqua	water
aq. dest.	aqua destillata	distilled water
b.i.d.	bis in die	twice a day
c.	cum	with
cochl.	cochleare	spoon
c.m.	cras mane	to-morrow morning
c.n.	cras nocte	to-morrow night
dil.	dilutus	diluted
dur. dolor.	durante dolore	whilst the pain lasts
fl.	fluidum	fluid
ft.	fiat	let there be made
h.d.	horâ decubitûs	at bedtime
h.s.	horâ somni	at sleeping time
mitt.	mitte	send
M.	misce	mix
N.B.	nota bene	note well
o.m.	omni mane	every morning
part. vic.	partitis vicibus	in divided doses
p.c.	post cibum	after food
p.r.n.	pro re natâ	when required
q.d. or q.i.d.	quater in die	four times daily
q.s.	quantum sufficiat	sufficient quantity
Qq. hor.	quâque horâ	every hour
quotid.	quotidie	daily
sine	sine	without
ss, or s, or ſs.	semis	a half
s.o.s.	si opus sit	if necessary
stat.	statim	immediately
sum.	sumendum	let it be taken
t.d. or t.i.d.	ter in die sumendum	let it be taken thrice daily
ut dict.	ut dictum	as directed

THE PHARMACY AND POISONS ACT, 1933; THE POISONS RULES, 1935; AND THE DANGEROUS DRUGS ACTS

Regulations with regard to the ordering, custody, and administration of dangerous drugs and poisons. Guy's Hospital, by kind permission.

1. The new Statutory Rules and Orders with regard to Poison, issued by the Home Office, come into force on 1st May 1936. As the provisions of the Pharmacy and Poisons Act, 1933, and the Statutory Rules do not repeal certain sections of the Dangerous Drugs Act, it appears desirable to set out generally the procedure which must be followed in order to comply with the provisions of all these Enactments.

2. The sections of the Poisons Rules, 1935, which affect hospitals are Rules 20, 26, 27, and 28, as follows:

Rule 20.—(1) It shall not be lawful to sell or supply any poison—

(*a*) in the case of a liquid other than a medicine, contained in a bottle of a capacity of not more than 120 fluid ounces, unless the bottle is labelled with the words, ' Not to be taken ';

(*b*) in the case of an embrocation, liniment, lotion, liquid antiseptic, or other liquid medicine for external application, unless the container is labelled with the name of the article and the words ' For external use only.'

(2) It shall not be lawful to sell or supply any compressed hydrocyanic acid, unless the container is labelled with the words ' Warning. This container holds poisonous gas and should only be opened and used by persons having expert knowledge of the precautions to be taken in its use.'

(3) This Rule shall be in addition to the other requirements of the Act and of these Rules with respect to labelling and shall apply to transactions exempted by Section 19 of the Act, but shall not apply to the sale or supply of poisons to be exported to purchasers outside the United Kingdom.

Special Provisions with respect to Hospitals

Rule 26.—(1) The provisions of Part II of the Act and of these Rules, except the provisions of Rule 20, shall not apply with respect to:

(*a*) any medicine for the treatment of human ailments dispensed from a hospital, infirmary, or dispensary maintained by any public authority, or out of public funds, or by a charity, or from any institution approved by the Minister of Health for the purposes of Section 24 (4) of the National Health Insurance Act, 1924;

(*b*) any medicine for the treatment of animals supplied from a veterinary hospital which is under the superintendence of a registered veterinary surgeon;

if the requirements contained in the following provisions of this Rule are satisfied in relation thereto.

(2) The medicine must not be supplied except by, or on and in accordance with a prescription of, a duly qualified medical practitioner for the purposes of medical treatment, or a registered dentist for the purposes of dental treatment, or a registered veterinary surgeon for the purposes of animal treatment.

(3) In a case where a substance included in the First Schedule to these Rules is supplied, a record must be kept on the premises in such a way that

there can readily be traced at any time during a period of two years after the date on which the substance was supplied the following particulars:

(*a*) The name and quantity of the poison supplied; and
(*b*) The date on which the poison was supplied; and
(*c*) The name and address of the person to whom the poison was supplied; and
(*d*) The name of the person who supplied the poison or who gave the prescription upon which it was supplied:

Provided that this paragraph shall not apply to a medicine supplied on and in accordance with a prescription given by a duly qualified medical practitioner under and in accordance with the Acts relating to national health insurance.

(4) The container of the medicine must be labelled:

(*a*) with a designation and address sufficient to identify the hospital, infirmary, dispensary, or institution from which it was supplied;
(*b*) except in the case of a medicine made up ready for treatment, with the word ' Poison ';
(*c*) in the case of a poison supplied from a veterinary hospital, with the words ' For animal treatment only ';

and in the case of a medicine to which Rule 20 applies the requirements of that Rule shall be satisfied in addition to the requirements aforesaid.

27.—(1) This and the next following Rule apply to any hospital, infirmary, dispensary, clinic, nursing home, or other institution at which human ailments are treated (hereinafter referred to as ' an institution ').

(2) In any institution in which medicines are dispensed in a dispensing or pharmaceutical department in charge of a person appointed for that purpose, no medicine containing a poison shall be supplied from that department, except in cases of emergency, for use in the wards, operating theatres or other sections of the institution, except in accordance with the requirements contained in the following provisions of this Rule.

(3) The medicines must not be supplied except upon a written order signed by a duly qualified medical practitioner, registered dentist, or by a sister or nurse in charge of a ward, theatre, or other section of the institution.

(4) The container of the medicine must be labelled:

(*a*) with the words describing its contents;
(*b*) in the case of substances included in the First Schedule to these Rules, with a distinguishing mark or other indication indicating that the poison is to be stored in a cupboard reserved solely for the storage of poisons.

Rule 28.—(1) In any institution in which medicines are dispensed in a dispensing or pharmaceutical department in charge of a person appointed for the purpose, all poisons other than those issued for use within the institution must be stored in that department.

(2) In any institution to which the foregoing paragraph does not apply all poisons other than those issued for use within the institution must be stored:

(*a*) in charge of a person appointed for the purpose by the governing body or person in control of the institution; and
(*b*) in the case of substances which are included in the First Schedule to these Rules either in a cupboard or drawer, or on a shelf, reserved solely for the storage of poisons.

In a case where a poison is stored on a shelf, the container of the poison must be rendered distinguishable by touch from the containers of articles other than poisons stored on the same premises.

(3) In every institution, every substance included in the First Schedule to these Rules which is stored in the wards must be stored in a cupboard reserved solely for the storage of poisons and poisonous substances.

(4) All places in which poisons are required by this Rule to be stored must be inspected at regular intervals of time not exceeding three months by a pharmacist or by some other person appointed for the purpose by the governing body or person in control of the institution.

DANGEROUS DRUGS ACT, 1920–32

Page 6. II. Prescriptions

Para. 8. The following remarks apply to all prescriptions for medicines containing a dangerous drug in sufficient strength to come within the Act, with the exception of the preparations mentioned in Para. 5.

(N.B. The raw materials may not be supplied on a prescription or dispensed to a patient.)

Para. 9. The Regulation requires that the prescription:

- (*a*) must be in writing and be dated;
- (*b*) must be signed with the usual signature of the prescribing doctor or dentist;
- (*c*) must bear the address of the prescribing doctor or dentist (exception in the case of health prescription, i.e. prescriptions under the Act, relating to N.H.I., or in connection with a health service of a local authority).
- (*d*) must state the name and address of the patient;
- (*e*) must in all cases specify the total amount of morphine, cocaine, or other drug to be supplied, except that, if it prescribes a preparation contained or an admixture compounded of preparations all of which are contained in the B.P., the B.P. Codex, or the Drug Tariff issued by the Minister of Health for the purpose of N.H.I., only the total amount of the preparation or of each preparation, as the case may be, need be specified.

Page 8. IV. Records to be kept

Para. 20. Doctors are required to keep records in the manner described below, of the dangerous drugs obtained by them, and of the dangerous drugs supplied by them.

Dentists are required only to keep a record of drugs obtained, as they have no authority to dispense the drugs.

(*a*) *Register of Drugs obtained*

Para. 21. Separate registers or separate parts of a register are to be appropriated for each of the drugs. The form in which the register has to be kept is as follows:

(The class of drugs or preparations to which the entries relate to be specified at the head of each page in the Register.)

Date on which supply received	Name	Address	Amount obtained	Form in which obtained
	of person or firm from whom obtained			

Para. 22. The correct entry in the Register must be made on the day on which the drug is received or the following day, and an entry once made must not be cancelled, obliterated, or altered; any mistake must be corrected by a foot-note or marginal note, giving the correct particulars and dated.

(*b*) *Register of Supplies*

Para 23. Similarly, separate registers or parts of a register must be kept for each drug ' supplied ' in the following form:

(The class of drugs and preparations to which the entries relate to be specified at the head of each page in the Register.)

Date on which the transaction took place	Name	Address	Authority of person or firm supplied to be in possession [1]	Amount supplied	Form in which supplied
	of person or firm supplied				

It is not necessary to enter in the register of supplies particulars of drugs administered to a patient by the doctor or dentist personally or by someone acting under the direct personal supervision of a doctor or dentist and in his presence. Thus, drugs handed to the patient or to the nurse in attendance on the patient for subsequent administration must be recorded as supplies. As a dentist has no authority to supply dangerous drugs in any other manner, he is under no obligation to keep the register of supplies, but he must keep the register of drugs obtained.

Para. 24. The entry must be made on the day on which the drug is supplied or the following day. The same rule as to mistakes and corrections applies as in the case of the register of drugs obtained.

Para. 25. It is specially provided, however, by the Regulations that if a doctor keeps a day book in which he records particulars of any of the drugs supplied by him to his patients, with the name and address of the patient and date of supply, he need only record in his register of supplies the date and the appropriate reference to the entry in his day book.

Para. 26. A doctor or dentist who practises at more than one set of premises is required to keep a separate register or registers at each set of premises at which the dangerous drugs are kept. Transfers of dangerous drugs from one surgery to another should be entered in both registers.

Para. 27. All records, including registers and day books, must be kept for not less than two years from the date of the last entry therein.

VI. Hospitals, etc.

Para. 31. Hospitals, asylums, poor law institutions, or sanatoria supported by a public authority or out of public funds or by a charity or voluntary subscriptions, have been exempted by Home Office order from the operation of the D.D. regulations, subject to compliance with the conditions laid down in the order.

Para. 32. The foregoing exemption does not apply to private hospitals, sanatoria, nursing homes, and similar establishments, where the full requirements of the Regulations must be strictly observed. No person in such places may be in the possession of or administer the drugs unless he is a doctor or dentist or other person authorized by the Regulations or unless he is

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[1] Where, as will almost invariably be the case, the supply is to a patient, it will be sufficient to enter the word 'patient' in this column.

administering the drug under the direct personal supervision and in the presence of the doctor or dentist or unless the drug has been supplied on a prescription of or dispensed by a doctor for the use of the patient.

VII. Inspection

Para. 33. All registers and other records required to be kept for the purpose of the D.D. Acts and Regulations thereunder, and any stocks of the drugs held, must at all times be available for inspections by any duly authorized inspector.

Para. 34 deals with whom the Home Secretary has authorized.

Para. 35. Notice of a visit for the purposes of inspection will not necessarily be given, and medical practitioners who dispense should make such arrangements that the register and other records can be produced, if required, for inspection in their absence.

STATUTORY RULES AND ORDERS

1937. *No. 560*

DANGEROUS DRUGS

dated 18th June, made by the Secretary of State in pursuance of Section 7 of the D.D.A. 1920 (10 and 11 Geo. 5. c. 46) for controlling the Manufacture, Sale, Possession and Distribution of D.Ds. to which Part III of that Act implies.

This regulation does not appear to alter notes made on previous Acts *re* hospitals and nurses.

ECONOMY IN THE USE OF DRUGS IN WARTIME

M.R.C. Memo. No. 3

Contains a list of drugs, their substitute or equivalent, and those under Government control.

The appendix deals with production of drugs within the United Kingdom and the British Empire.

STORAGE OF DANGEROUS DRUGS AT FIRST AID POSTS

Circular 144. Ministry of Health

Gives instructions which, if carried out in detail, will satisfy the Home Office and Pharmaceutical Society *re* the care of dangerous drugs.

From LAW FOR NURSES AND NURSE-ADMINISTRATORS

S. R. Speller, LL.B.

Page 171. E. Provisions of the Dangerous Drugs Act, 1920–5

1. *General Rules*

By the Dangerous Drugs Regulations, 1937, certain classes of persons are specially authorized, so far as may be necessary for the practice or exercise of their respective professions, functions, or employments, in their capacity as members of their respective classes, to be in possession of and to supply drugs, among others, medical practitioners and pharmacists dispensing medicines at a public hospital or other public institution.

2. *Hospitals exempt from General Rules*

Under the D.D. (Hospitals General Exemption) Order, 1924, public authority hospitals and sanatoria, as well as voluntary (charitable) hospitals, are exempt from the general regulations under the D.D. Acts, 1920–5, provided drugs are dispensed by a medical practitioner or qualified pharmacist, and poor law institutions are exempted in like manner, provided the dispenser holds a qualification approved by the Minister of Health, who must also have approved his appointment. In all these cases, the following rules must be observed:

(*a*) All orders for supply of drugs must be signed by one of the medical practitioners attached to the hospital or by the dispenser if a qualified pharmacist.

(*b*) The person responsible for dispensing medicines has charge of the drugs and must keep a record of supplies received in a drug ledger.

(*c*) Dangerous drugs must be dispensed for individual patients only on prescription of a medical practitioner in writing, dated and signed or initialled; the name or number of the patient must be mentioned. A fresh prescription must be given when another supply is needed.

(N.B. Differs from the rule under the Pharmacy and Poisons Act.)

(*d*) The person dispensing the prescription must mark it as dispensed and make a record to be kept for at least two years.

(*e*) Stock preparations for wards or out-patients' departments to be supplied only on requisition of sister-in-charge and kept by her under lock and key, and only used by her in accordance with the directions of one of the medical practitioners in charge of the patient.

(*f*) The sister's requisition is filed in the dispensary and the sister must keep a copy.

(*g*) Adequate precautions must be taken to prevent theft of drugs whilst being conveyed from dispensary to wards or out-patients department.

3. *Special Exemptions*

Hospitals, etc., as above mentioned, where the dispensary is in charge of a qualified dispenser, e g. a holder of the certificate of the Society of Apothecaries or the appropriate R.A.M.C. qualifications, may obtain individual exemption on the above conditions.

Hospitals and institutions not staffed to be exempt under 2 or specially exempt under 3.

To hospitals and other institutions as defined in the order where drugs are not dispensed by a medical practitioner, pharmacist, or, where specially permitted, by a qualified dispenser, the following rules apply:

(*a*) All supplies of dangerous drugs are to be obtained on the order of a medical practitioner attached to or attending the hospital, who certified them to be necessary for the treatment of patients.

(*b*) All supplies of dangerous drugs to be received by the matron or acting matron, and kept by her in a locked cupboard of which she alone has the key. She is responsible for keeping the drug ledger, entering up all supplies received.

(*c*) The matron or acting matron must use the dangerous drugs only in accordance with directions of the medical practitioner attached to or attending the hospital.

(*d*) In a poor law hospital, the responsible person is the lady superintendent of nurses, if there is one, otherwise the matron, if a trained nurse, and otherwise the senior nurse or nurse in charge.

(*e*) Except as above, the regulations must be observed.

THERMOMETRIC SCALES

To convert Fahrenheit into Centigrade: Subtract 32 and multiply by $\frac{5}{9}$. Thus: 212° F. − 32 = 180 × 5 = 900 ÷ 9 = 100° C.

To convert Centigrade into Fahrenheit: Multiply by $\frac{9}{5}$ and add 32. Thus: 100° C. × 9 = 900 ÷ 5 = 180 + 32 = 212° F.

THERMOMETRY

Comparison of Fahrenheit and Centigrade Thermometers

°F	°C.	°F.	°C.	°F.	°C.
−40	−40	91·4	33	105·8	41
− 4	−20	92	33·33	106	41·11
0	−17·77	93	33·88	107	41·66
1	−17·22	93·2	34	108	42·22
5	−15	94	34·44	109	42·77
10	−12·22	95	35	110	43·33
15	− 9·44	96	35·55	120	48·88
20	− 6·66	96·8	36	130	54·44
25	− 3·88	97	36·11	140	60
30	− 1·11	98	36·66	150	65·55
32	0	98·6	37	160	71·11
50	10	99	37·22	170	76·66
60	15·55	100	37·77	180	82·22
70	21·11	100·4	38	190	87·77
80	26·66	101	38·33	200	93·33
82·4	28	102	38·88	210	98·88
86	30	102·2	39	212	100
87	30·55	103	39·44	220	104·44
89·6	32	104	40	240	115·55
90	32·22	105	40·55	250	121·11

Clinical Thermometer

35° C.	equals	95°	39° C.	equals	102.2° F.
36	,,	96·8	39·2	,,	102·5
36·2	,,	97·1	39·4	,,	102·9
36·4	,,	97·5	39·6	,,	103·2
36·6	,,	97·8	39·8	,,	103·6
36·8	,,	98·2	40	,,	104
37	,,	98.6	40·2	,,	104·3
37·2	,,	98·9	40·4	,,	104·7
37·4	,,	99·3	40·6	,,	105
37·6	,,	99·6	40·8	,,	105·4
37·8	,,	100	41	,,	105·8
38	,,	100·4	41·2	,,	106·1
38·2	,,	100·7	41·4	,,	106·5
38·4	,,	101·1	41·6	,,	106·8
38·6	,,	101·4	41·8	,,	107·2
38·8	,,	101·8	42	,,	107·6

AVERAGE WEIGHTS AND HEIGHTS

The following tables give the average weights and heights of males and females at different ages. It should be borne in mind that these averages are calculated from tables of the weights and heights of a large number of persons, and, though accurate as a general guide, are not necessarily true for each person. Having regard to the widely varying range in the height and weight of healthy people, it is obvious that the individual may not conform to such average standard, and a deviation of 15 per cent. in either direction from such standard is not seriously regarded. Of more importance than the actual weight is the proportion between height and weight. Great care must be taken that patients who are being weighed periodically should always be weighed on the same, or reliable, scales, and under precisely corresponding conditions, so far as possible, of clothing, food, time of day, etc.

Table A.—Average weight of the healthy male child during the first year of life:

	lb.	Kgm.		lb.	Kgm.
Weight at birth	6·8	3·08	Weight at seven months	13.4	6·08
,, one month	7·4	3·36	,, eight ,,	14·4	6·53
,, two months	8·4	3·81	,, nine ,,	15·8	7·17
,, three ,,	9·6	4·36	,, ten ,,	16·8	7·62
,, four ,,	10·8	4·90	,, eleven ,,	17·8	8·07
,, five ,,	11·8	5·35	,, twelve ,,	18·5	8·39
,, six ,,	12·4	5·63			

It should be noted that some slight loss of weight commonly occurs during the first few days after birth (p. 590).

Table B.—Average height, without shoes, and average weight, with clothes, of all classes of the general population of Great Britain. This table shows some facts uniformly observed, but not sufficiently borne in mind: (1) Growth is most rapid during the first five years of life, the rate of growth being about the same in both sexes, girls being a little shorter and lighter than boys. (2) From five to ten, boys grow more rapidly than girls. (3) From ten to fifteen girls grow more rapidly than boys. At eleven and a half to fourteen and a half they are actually taller, and from twelve and a half to fifteen and a half actually heavier, than boys. (4) From fifteen to twenty, boys begin again to increase more rapidly than girls, and complete their growth about twenty-three. (5) After fifteen, girls grow more slowly and practically reach their full height and weight at twenty. During childhood and adolescence, increase in weight is more marked in the winter and increase in height in the summer.

Males							Females						
Age last birth-day	Height			Weight			Age last birth-day	Height			Weight		
	ft.	in.	mm.	st.	lb.	Kgm.		ft.	in.	mm.	st.	lb.	Kgm.
1	2	5½	749	1	4½	8·39	1	2	3½	699	1	4	8·17
2	2	8½	826	2	4½	14·74	2	2	7	787	1	11¼	11·45
3	2	11	889	2	6	15·42	3	2	10	864	2	3½	14·29
4	3	1	940	2	9	16·78	4	3	0	914	2	8	16·33
5	3	4	1016	2	12	18·14	5	3	3	990	2	11	17·69
6	3	7	1092	3	2½	20·19	6	3	6	1066	2	13¾	18·94
7	3	10	1168	3	7¾	22·57	7	3	8	1117	3	5½	21·55
8	3	11	1194	3	13	24·95	8	3	10½	1180	3	10	23·59
9	4	1¾	1264	4	4½	27·44	9	4	0¾	1238	3	13½	25·18
10	4	3¾	1314	4	11½	30·62	10	4	3	1295	4	6	28·12
11	4	5½	1359	5	2	32·66	11	4	5	1346	4	12	30·85
12	4	7	1397	5	6¾	34·81	12	4	7½	1410	5	6½	34·70
13	4	9	1448	5	12½	37·42	13	4	9¾	1467	6	3	39·46

Table C.—**Average weight and height of male and female adults:**

Males				Females			
ft.	in.	st.	lb.	ft.	in.	st.	lb.
5	1	8	8	4	10	7	0
5	2	9	0	4	11	7	4
5	3	9	7	5	0	7	7
5	4	9	13	5	1	7	12
5	5	10	2	5	2	8	2
5	6	10	5	5	3	8	9
5	7	10	8	5	4	9	2
5	8	11	1	5	5	9	9
5	9	11	8	5	6	9	13
5	10	12	0	5	7	10	8
5	11	12	6	5	8	11	0
6	0	12	10				

PULSE TABLE (FREQUENCY OF PULSE RATE)

Age	Pulsations per minute
Foetus in Utero	140–160
New-born infants	130–140
During first year	115–130
,, second year	100–115
,, third year	90–100
About seventh year	85 – 90
,, fourteenth year	80 – 85
In adult age	70 – 80
In old age	60 – 70
In decrepitude	65 – 75

OBSTETRIC TABLE

JAN.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Oct.	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	Nov.
FEB.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28				
Nov.	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5				Dec.
MAR.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Dec.	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	Jan.
APRIL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Jan.	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4		Feb.
MAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Feb.	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3	4	5	6	7	Mar.
JUNE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Mar.	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6		April
JULY	1	2	3	4	5	6	7	8	9	10	1	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
April	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	May
AUG.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
May	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	June
SEPT.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
June	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7		July
OCT.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
July	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	Aug.
NOV.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Aug.	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6		Sept.
DEC.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Sept.	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	Oct.

TABLE OF INFECTIOUS DISEASES

Diseases	Incubation Period	Date of the definite illness on which the infection		Period of quarantine required after the latest exposure to infection	Period of infection ceases
		Appears	Begins to fade		
Asiatic Cholera	a few hours to 10 days, usually 3–6 days	—	—	12 days	7 days from cessation of diarrhoea. Carriers occur.
Chicken-pox (Varicella)	12-20 days	1st day and 3 following days	About the 4th day	20 days	When every scar has fallen off.
Diphtheria	1-7 days	—	—	12 days	In 4 weeks if bacteriological examination of the nose and throat and discharges proves negative.
Erysipelas	3–7 days	1st day	—	10 days	1 week after the rash has disappeared if desquamation has ceased.
German Measles (Rötheln)	7–18 days or even longer	1st-4th day	2nd-4th day	22 days	In not less than 10 days from the appearance of the rash.
Infantile Paralysis (Acute Anterior Polio-myelitis)	Thought to be about 4 days	—	—	14 days	Until the nose and throat are proved to be free from the germ.
Influenza	1–4 days, usually 3–4 days	—	—	5 days	3 days after the temperature has become normal and all discharges have ceased.
Measles (Morbilli)	4-14 days	4th day	5-7th day	16 days	In not less than 2 weeks from the appearance of the rash.
Mumps (Parotitis)	2-4 weeks, usually 18 days	—	—	24 days	In not less than 3 weeks and then only when 1 week has elapsed since the subsidence of all swelling.
Plague	2–8 days, in rare cases up to 15 days	—	—	21 days	In 1 month. When all discharge has ceased.
Puerperal Fever	3–5 days	—	—	—	—
Ringworm	—	—	—	—	When examination reveals no broken-off diseased hairs.

TABLE OF INFECTIOUS DISEASES—*continued*

Diseases	Incubation Period	Date of the definite illness on which the infection		Period of quarantine required after the latest exposure to infection	Period of infection ceases
		Appears	Begins to fade		
Scarlet Fever (Scarlatina)	2–6 days, usually 3–5 days	2nd day	5th day	10 days	When desquamation, sore throat, and albuminuria disappear, but never less than 6 weeks.
Spotted Fever (Cerebro-spinal Meningitis)	Uncertain, about 2–3 days	—	—	1 week	Until the secretions are free from the meningococcus.
Small-pox (Variola)	5–21 days	3rd-4th day	9th or 10th day	16 days	When every scab has disappeared.
Typhoid Fever (Enteric)	2–23 days	7th-9th day	21st day	23 days	Indefinite (typhoid carriers).
Typhus	2–14 days, very variable	4th-8th day	14th day	14 days	After 5 weeks.
Whooping Cough (Pertussis)	6–14 days	The characteristic whoop may not appear for 3 weeks	—	21 days	In 6 weeks from commencement, provided all characteristic spasmodic cough and whooping have ceased for 2 weeks at least.
Yellow Fever	1–14 days	—	—	15 days	—

The foregoing table is in general accord with a code of rules for the prevention of infectious and contagious diseases in schools. It indicates the day on which a child may usually return to school after suffering from, or being exposed to, infectious or contagious diseases, but the period of absence may be extended by the school medical officer, if in his judgment such extension be essential to the safety of the school. For descriptions of infectious and contagious diseases and their nursing, see Chapter VIII.

PREFIXES AND SUFFIXES USED IN MEDICAL TERMS

PREFIXES

A-, AN- Denotes the absence or want of a thing or quality expressed by the principal. *a* is used before consonants, *an* before vowels, and, rarely, *am-* before *bl* or *br*: e.g. *avitaminosis, anaemia* (p. 283), *amblyopia* (p. 642)

AD- To, at, toward: e.g. *adduction, adhesion.* The *d* is often changed in the compound to correspond to the next letter, as *appendix* (p. 231)

AMPHI- Upon both sides, in two ways, about, around: e.g. *amphibious*

ANA- Up, through, again: e.g. *anasarca* (p. 191), *anatomy.* In prescriptions, contracted to *āā.*, meaning *of each* (p. 847)

ANTI- (or ANT-) Against, opposed to, opposite of: e.g. *antipyretic* (p. 765), *antagonist* (p. 770)

APO- Off, away, from, separation: e.g. *apophylaxis, apophysis*

AUTO- Self, of itself: e.g. *autoactivation*

BARY- Heavy, difficult, dull or hard: e.g. *baryglossia*

BI-, BIN- (BIS) Twice, twofold, double: e.g. *bicuspid, binaural, bisaxillary*

BIO- Life: e.g. *biology*

BRACH- Arm, pertaining to the arm: e.g. *brachialgia*

BRONCHO- Relating to the bronchi: e.g. *bronchophony*

CARDI-, CARDIO- Pertaining to the heart: e.g. *carditis, cardiogram*

CATA- Downward, or according to, or against: e.g. *catapasm, cataphoresis* (p. 742)

COELI-, CELIO- Pertaining to the belly: e.g. *coeliac, celiotomy*

CHIRO- The hand: e.g. *chiroplasty*

CO-, CON- Together, along with: e.g. *coitus, congenital* (p. 608)

DACTYL- A finger, pertaining to a finger or toe: e.g. *dactyloid*

DERMATO-, DERMO- Pertaining to the skin: e.g. *dermatitis, dermographism* (p. 417)

DI- Two, or twice: e.g. *dicrotic* (p. 201)

DIA- Through: e.g. *diarrhoea* (p. 186)

DYN- Force, power: e.g. *dynamic, dynamo*

DYS- Difficult, painful, hard, bad: e.g. *dyspnoea* (p. 205), *dysmenorrhoea* (p. 686)

EC-, EX-, EXO- Out of, away from, without, upon the outer side: e.g. *ecmnesia, excision* (p. 470)

EM-, EN- In, within: e.g. *empyema* (p. 264), *encephalitis* (p. 379)

END-, ENDO- Within, inside, inner, internal: e.g. *endarteritis, endocrine*

ENTERO- Denoting relation to the intestine: e.g. *enteroptosis*

EPI- Upon, over, above: e.g. *epidermis* (p. 415), *epicondyle, epicanthus*

EXTRA- Outside, without: e.g. *extravasation, extradural*

GALA-, GALACT- Milk: e.g. *galazyme, galactase*
GASTRO- Relating to the stomach: e.g. *gastro-enterostomy* (p. 506)
GENIO- Pertaining to the chin: e.g. *genioplasty*
GLOSSO- Pertaining to the tongue: e.g. *glossoplegia*

HAEMA-, HAEMATO-, HAEMO-, HEM-, HEMA-, HEMATO- Of or pertaining to the blood: e.g. *haematemesis, haematocele* (p. 495), *haemoptysis, hematoma, hemagogue, hematosalpinx*
HEMI- Half: e.g. *hemiplegia*
HEPAT-, HEPATO- Pertaining to the liver: e.g. *hepatic, hepatodynia*
HETER-, HETERO- Unlike, different, opposite: e.g. *heteradenia, heteroplasty*
HYDR-, HYDRO- Water, relating to or resembling water: e.g. *hydramnios* (p. 692), *hydrocele* (p. 191)
HYPER- Above, beyond, excessive, exaggerated: e.g. *hyperpyrexia, hyperaemia*
HYPNO- Relating to sleep, hypnotism: e.g. *hypnotic* (p. 767), *hypnophobia*
HYPO- Deficiency or lack, below, or beneath: e.g. *hypoglycaemia, hypocardia, hypoglossal*
HYSTER-, HYSTERO- Relating to the uterus: e.g. *hysterectomy* (p. 680), *hysterodynia*

ILEO- Pertaining to the ileum: e.g. *ileotomy*
ILIO- Relating to the ilium: e.g. *iliocolotomy*
IM-, IN- Negative: e.g. *immature, incontinence*
IN- Within, upon, by: e.g. *inspiration* (p. 205), *ingestion*
INFRA- Below, beneath: e.g. *infraspinous, infratonsillar*
INTER- Between: e.g. *intercostal*
INTRA- During or within: e.g. *intradermic, intranatal*
ISO- Equality, alike: e.g. *isocoria, isodactylism*

KATA-, KATH- Down or intensive: e.g. *katatonia, kathisophobia*

LEUCO-, LEUKO- White: e.g. *leucorrhoea, leukotrichous*
LITH-, LITHO- Relation to stone or to calculi: e.g. *lithiasis* (p. 244), *lithotomy* (p. 454)

MACRO- Large, long, or great, hypertrophy: e.g. *macrobacteria, macrodactylia*
MAL- Bad: e.g. *malformation* (p. 608), *malunion*
MAST-, MASTO- Relating to the breast: e.g. *mastitis* (p. 713), *mastoparietal*
MEGA-, MEGALO- Large: e.g. *megacolon* (p. 607), *megalomania*
MELANO- Dark coloured, blackness, relating to melanin: e.g. *melanotic* (p. 314), *melanochlorosis*
MENO- Relating to the menses: e.g. *menorrhagia*
MESO- Middle, or pertaining to the mesentery: e.g. *mesocolon, mesoneuritis*
META- Among, between, over, beyond, change or transformation: e.g. *metabolism* (p. 152), *metacarpus*
METRO- Relating to the uterus: e.g. *metrorrhagia*
MICRO- Minute: e.g. *micro-organism*
MILLI- A thousand: e.g. *millimetre* (p. 842)
MON-, MONO- One, single: e.g. *monarthritis, monococcus*
MORPHO- Shape, form: e.g. *morphology*
MULTI- Many: e.g. *multipara* (p. 693)
MUSCULO- Relating to muscles: e.g. *musculospiral* (p. 367)
MYCO- Relating to fungi: e.g. *mycosis*

MYELO- Relating to the spinal cord or bone marrow: e.g. *myelomeningitis*
MYO- Pertaining to muscle: e.g. *myocele*
MYX-, MYXO- Relating to mucus, mucoid: e.g. *myxoedema* (p. 296), *myxoma*

NARCO- Numbness, stupor: e.g. *narcotic* (p. 768)
NASO- Connected with the nose: e.g. *naso-antritis*
NEO- New: e.g. *neoplasty*
NEPHR-, NEPHRO- Pertaining to the kidney: e.g. *nephritis, nephrotomy* (p. 489)
NEURO- Connection with or relation to a nerve: e.g. *neuroma* (p. 471)

OB- On, against, in front of, towards: e.g. *obturator*
ODONTO- Pertaining to a tooth: e.g. *odontoid, odontorrhagia*
OLIGO- Deficiency, want: e.g. *oligodactylia, oligocholia*
ONYCHO- Relating to the nails: e.g. *onycholysis*
OÖPHORO- Relating to the ovary: e.g. *oöphoroma*
OPHTHALMO- Pertaining to the eye: e.g. *ophthalmomalacia*
OPTO- Relating to the eye or to vision: e.g. *optomyometer*
ORCHI-, ORCHID-, ORCHIO- Relating to the testicle: e.g. *orchi-epididymitis, orchidectomy, orchiocele*
ORGANO- Relating to the organs: e.g. *organotherapy*
ORTHO- Straight, normal, true: e.g. *orthocytosis, orthodontia*
OSTEO- Connection with or relation to bone: e.g. *osteoarthritis* (p. 311)
OT-, OTO- Relating to the ear: e.g. *otitis* (p. 656), *otosclerosis*
OVI- Relating to the ovum: e.g. *oviform*
OXY- Sharp or acid: e.g. *oxyaphia*

PACHY- Thick: e.g. *pachyglossia*
PAN- All, every, the whole of anything: e.g. *panhysterectomy* (p. 518), *panarthritis*
PARA- Beyond, beside, near, the opposite of: e.g. *parametritis* (p. 683), *paraphrasia* (p. 364)
PERI- Around or surrounding: e.g. *pericardium*
PHACO- Pertaining to a lens, or the lens of the eye: e.g. *phacometer, phacolysis*
PHARMACO- Relating to drugs: e.g. *pharmacopsychosis*
PHARYNGO- Pertaining to the pharynx: e.g. *pharyngotomy*
PHLEBO- Relating to a vein: e.g. *phlebotomy*
PHORO- Motion: e.g. *phorotone*
PHOSPHO- Relating to phosphorus or to its compounds: e.g. *phosphorescence*
PHRENO- Relating to the mind or the diaphragm: e.g. *phrenoblabia, phrenocostal*
PLEURO- Denoting connection with the pleura or with a side or rib: e.g. *pleurodynia, pleurothotonos*
PNEUMO- Relating to the lungs: e.g. *pneumorrhagia*
POD- Foot: e.g. *podagra*
POLIO- Grey: e.g. *poliomyelitis* (p. 346)
POLY- Many, much: e.g. *polychoria, polycystic*
POST- After, behind: e.g. *post-natal*
PRE-, PRAE- Before: e.g. *pre-aortic, placenta praevia* (p. 703)
PRO- For, before, in front of: e.g. *prochondral, prodrome*
PROCT-, PROCTO- Relating to the anus or rectum: e.g. *proctalgia, proctoscope* (p. 679)
PSEUD-, PSEUDO- False: e.g. *pseudo-crisis* (p. 193)

PY-, PYO- Pertaining to pus: e.g. *pyaemia* (p. 577), *pyonephrosis* (p. 240)
PYRETO- Fever: e.g. *pyretogen*
PYRO- Fire or heat: e.g. *pyrophobia, pyrosis*

QUADRI- Four, or four times: e.g. *quadriplegia*

RADIO- Pertaining to radiant energy rays or to radium, relating to the radius: e.g. *radiolucent, radiode, radiocarpal*
RETRO- Back, backward, or behind: e.g. *retrocervical, retromastoid*
RHACHI-, RHACHIO- Pertaining to the spine: e.g. *rhachicentesis, rhachiodynia*
RHEO- Pertaining to a current: e.g. *rheophore* (p. 739)
RHIN-, RHINO- Pertaining to the nose: e.g. *rhinaesthesia, rhinocleisis*
RHIZO- Root: e.g. *rhizotomy, rhizodontrypy*

SACRO- Relating to the sacrum: e.g. *sacrotomy*
SALPINGO- Relating to the Fallopian or Eustachian tubes: e.g. *salpingoeyesis, salpingostenochoria*
SAPR-, SAPRO- Pertaining to decay, putrid: e.g. *sapraemia* (p. 711), *saprophyte* (p. 826)
SCHISTO-, SCHIZ-, SCHIZO- Split or fissured: e.g. *schistocystis, schizaxon, schizoblepharia*
SCLERO- Hard: e.g. *scleroderma, sclerosis* (p. 202)
SEMI- Half: e.g. *semilunar cartilage*
SERO- Relating to serum: e.g. *sero-enteritis*
SEX- Six: e.g. *sexidigital*
SPHYGMO- Relating to the pulse: e.g. *sphygmograph* (p. 203)
SPLEN-, SPLENO- Relating to the spleen: e.g. *splenectomy* (p. 509), *splenocele*
SPORO- Relating to a spore or seed: e.g. *sporophore*
STEREO- Solid, or related to solidity: e.g. *stereocyst*
STETHO- Pertaining to the chest: e.g. *stethoscope, stethospasm*
SUB- Under, beneath, or deficiency: e.g. *subaxillary, subconjuctival, subinvolution*
SUPER- Above, upon, excessive: e.g. *supercilium, superficial, superflexion*
SUPRA- Upon or above: e.g. *suprarenal* (p. 299), *supratonsillar*
SYM-, SYN- With or together: e.g. *symblepharon* (p. 642), *synarthrosis*

TARSO- Pertaining to the tarsus: e.g. *tarsotomy*
THERMO- Heat: e.g. *thermohyperaesthesia*
THYRO- Relating to the thyroid cartilage or gland: e.g. *thyrochondrotomy, thyroidectomy* (p. 482)
TOPO- Localized, relating to a part: e.g. *topoanaesthesia*
TOX-, TOXI-, TOXICO-, TOXO- Poisonous, or caused by poison: e.g. *toxaemia, toxicosis, toxicoderma, toxonosis*
TRACHELO- Relating to the neck: e.g. *trachelomyitis*
TRACHEO- Connection with or relating to the trachea: e.g. *tracheotomy* (p. 662)
TRANS- Through or across: e.g. *transfusion* (p. 74), *transmission*
TRICH-, TRICHO- Pertaining to a hair: e.g. *trichiasis, trichopathy*
TUBO- Relating to a tube: e.g. *tuboperitoneal*

UNI- One: e.g. *unilateral*

URINO-, URO- Pertaining to the urine or uric acid: e.g. *urinometer* (p. 35), *urodynia*
UTERO- Pertaining to the uterus: e.g. *uteroplasty*

XENO- Strange, foreign: e.g. *xenogenous*
XERO- Dry: e.g. *xeromycteria*

ZOO- Animal or pertaining to an animal: e.g. *zoophobia*

-AEMIA, -EMIA Relating to the blood, or an ingredient of blood, expressed by the preceding part of the word: e.g. *uraemia* (p. 238), *pyemia* (p. 577)
-AGOGUE Denoting agents that drive out other substances: e.g. *emmenagogues*
-AGRA Denotes seizure, severe pain: e.g. *podagra*
-ALGIA Denoting pain: e.g. *odontalgia*
-ASIS A termination denoting a process or its result: e.g. *lithiasis* (see *-osis*)

-CELE A tumour, swelling, or hernia: e.g. *haematocele*

-ECTOMY A cutting out, exision: e.g. *thyoidectomy* (p. 482)

-FUGE An expellent, to drive out: e.g. *vermifuge* (p. 765)

-GRAPH, -GRAPHIC, -GRAPHY Relating to writing, drawing, photography, or recording automatic tracings of rhythm, etc.: e.g. *sphygmograph* (p. 203), *dermographic*, *radiography*

-ISM The doctrine, practice, or theory of the principal word: e.g. *Darwinism*
-ITE In anatomy denotes a constituent part of an organ: e.g. *sternite*. In chemistry, any salt of an -ous acid: e.g. *sulphite*
-ITIS Inflammation: e.g. *cholangitis* (p. 233)

-LYSIS The setting free of some part, a separation into constituent parts: e.g. *cardiolysis* (p. 487)

-MALACIA Abnormal softening: e.g. *ophthalmomalacia*

-ODYNE, -ODYNIA Pain: e.g. *anodyne*, *urodynia*
-OID Likeness, resemblance: e.g. *melanoid*
-OLOGY Science, or a special line of study: e.g. *physiology*
-OMA A neoplasm or tumour: e.g. *carcinoma* (p. 314)
-OPIA Relating to the eye or vision: e.g. *presbyopia* (p. 642)
-OSE Denoting a member of the carbohydrate group: e.g. *lactose*
-OSIS Condition of, or state caused by: e.g. *scoliosis* (p. 620)
-OTOMY Incision: e.g. *cystotomy* (p. 492)

-PATHY Method of cure, also condition of disease: e.g. *homoeopathy, osteopathy, adenopathy*
-PHOBIA Obsession or fear, characteristic of insanity: e.g. *pyrophobia*
-PLASTY Surgical repair operation: e.g. *chiroplasty*

-RHAGIA Excessive discharge, haemorrhage: e.g. *gastrorrhagia* (p. 563)
-RHAPHY Suturing or stitching a part: e.g. *colporrhaphy* (p. 682)
-RHEA Excessive excretion or discharge: e.g. *otorrhea*

-SCOPE Signifying to see or examine: usually forming a part of the name of some instrument: e.g. *ophthalmoscope* (p. 364)
-SCOPY Denoting inspection or examination: e.g. *laryngoscopy*
-STOMY A mouth, an opening. Used in the names of operations in which an artificial opening or a passage is formed: e.g. *colostomy* (p. 508)

-TION An occurrence, denoting an action of function as taking place: e.g. *operation*
-TY Meaning abstract quality or idea: e.g. *solidity*

-ULUS, -ULA, -ULUM, -OLA, -ION, -ELLUS, -ILLUS, -LEUS Diminutives
-URIA Relating to abnormal urine: e.g. *haematuria* (p. 237)

For definition of these terms see page references and glossary.

GLOSSARY

Abortion. Expulsion of ovum from uterus before the placenta is formed (p. 705)

Abrasion. Injury to the skin, the scarf skin being destroyed and the true skin exposed (p. 519)

Acetonuria. The presence of acetone in urine (p. 236)

Adduction. Any movement whereby a part is brought towards another or towards the median line of the body (p. 860)

Adenitis. Inflammation of glands (p. 470)

Adenopathy. Any disease of a gland (p. 318)

Adhesion. Abnormal union of two surfaces as a result of inflammation (p. 857)

Albuminuria. The presence of albumin in urine (p. 236)

Allergy. An altered reaction in man to foreign proteins, or hypersensitiveness to proteins (p. 304)

Amenorrhoea. Abnormal absence of the menses (p. 686)

Amphibious. Living both on land and in water (p. 859)

Analgesia. Diminished sensibility to pain (p. 363)

Anasarca. General dropsy (p. 191)

Anatomy. The science of the structure of organs or of organic bodies (p. 857)

Aneurysm. A local dilatation of an artery (p. 278)

Anhidrosis. Deficiency of perspiration (p. 412)

Ankylosis. The stiffening of a joint; a fusion or union of the ends of bones (p. 473)

Anorexia. Absence of appetite (p. 210)

Antigen. Any substance which when inoculated into the body is capable of causing the production of antibodies (pp. 305, 833).

Antiseptics. Substances which prevent or check putrefaction (p. 765)

Anuria. Suppression of urine (p. 237)

Aphasia. Speechlessness; loss of power of speaking (p. 364)

Aphonia. Loss of voice: voicelessness (p. 393)

Apnoea. Interrupted or suspended respiration (p. 206)

Apophylaxis. A diminution of the protective power of the blood (p. 859)

Apophysis. A process, outgrowth, or swelling of some part or organ as of a bone (p. 859)

Arrhythmia. Irregular and intermittent action of the heart (p. 277)

Ascites. Dropsy of the abdomen (p. 268)

Aseptic. Free from bacterial infection (p. 428)

Asthenia. A failure or loss of strength (p. 210)

Atrophy. Wasting, want of nutrition (p. 192)

Aura. A sense of rising air, a premonitory symptom of an epileptic fit (p. 385)

Autoactivation. The activation of a gland by an enzyme or hormone derived from itself (p. 860)

Avitaminosis. A disease resulting from deficiency of vitamins in the diet (p. 302)

Baryglossia. Thick, slow utterance (p. 860)

Bicuspid. Having two cusps; bicuspid valve=mitral valve (p. 270)

Binaural. Pertaining to or having two ears; used for both ears (p. 860)

Biology. The science of life and living things (p. 860)

Bisaxillary. Pertaining to the axillae (p. 860)

Borborygmus. A rumbling noise caused by flatus in the bowels (p. 209)

Bougie. A cylindrical instrument used for dilating contracted passage (p. 65)

Brachialgia. Pain or neuralgia in the arm or in the brachial plexus (p. 388)

Bromidrosis. Fetid perspiration (p. 412)

Bronchophony. The resonance of the voice within the bronchi (p. 860); as heard on auscultating the chest (p. 860)

Bulimia. Voracious appetite (p. 210)

Cachexia. The expression of a general defective nutrition of the various tissues, the result of chronic diseases such as cancer (p. 314)

Cardiogram. The tracing of the cardiac impulse made by the cardiograph (p. 860)

Carditis. Inflammation of the heart (p. 269)

Carphology. Picking the bedclothes (p. 208)

Catapasm. A dry powder to be sprinkled on the skin or on a sore (p. 853)

Celiotomy. Surgical opening of the abdominal cavity (p. 510)

Cellulitis. Diffuse cellular inflammation (p. 569)

Cestodes. Intestinal worms; tapeworm (p. 225)

Cheilosis. Inflammation of the lips (p. 786)

Chiroplasty. A plastic operation on the hand (p. 860)

Choluria. Bile in the urine (p. 236)

Chromidrosis. Coloured perspiration (p. 413)

Chyluria. Milk-like urine (p. 236)

Climacteric. The cessation of menstruation in females (p. 687)

Coeliac. Abdominal, pertaining to the belly (p. 860)

Coitus. The act of sexual connection (p. 860)

Colitis. Inflammation of the colon (p. 223)

Coma-vigil. Unconsciousness with open eyelids and a muttering delirium (p. 361)

Coryza. Cold in the head; nasal catarrh (p. 353)

Crepitus. A crackling noise (p. 527)

Cyanosis. Blue appearance; a congestion of the venous system (p. 188)

Cystitis. Inflammation or catarrh of the bladder (p. 245)

Dactyloid. Resembling a finger (p. 860)

Defecation. The act of evacuating the bowel (p. 186)

Defervescence. Reduction of the temperature of the body (p. 331)

Deglutition. The act of swallowing (p. 661)

Dehydration. The removal of water (p. 563)

Delusion. A false belief, the falsity of which is apparent, but out of which the person cannot be reasoned by indubitable evidence (p. 403)

Dermatitis. An inflammation of the skin (p. 419)

Dermographic. See dermographism

Dermographism. A condition of the skin in which tracings made with the finger-nail or a blunt instrument are followed by elevations at the points irritated (p. 417)

Diaceturia. The presence of diacetic acid in urine (p. 236)

Diaphoretics. Agents which increase perspiration (p. 767)

Diaphysis. The middle part, or shaft, of long bones (p. 527)

Dicrotic. An apparent double beat of the pulse (p. 201)

Distal. Extreme: at the greatest distance from a central point; peripheral (p. 564)

Diuresis. An abundant excretion of urine (p. 242)

Dynamic. Pertaining to energy; sthenic; characterized by energy or great force (p. 860)

Dynamo. Dynamo-electric machine converting mechanical into electric energy by rotation of copper-wire coils in magnetic field (p. 860)

Dysmenorrhoea. Difficult or painful menstruation (p. 686)

Dysphagia. Difficulty in swallowing (p. 670)

Dyspnoea. Difficult breathing (p. 205)

Ecchymosis. A bruise; an effusion of blood under the skin (p. 563)

Ecmnesia. A gap in memory; amnesia in which there is a normal memory to a certain date and loss of memory for a period after it (p. 860)

Ectopotomy. Laparotomy for the removal of the contents of an extra uterine gestation (p. 511)

Embolism. The obstruction of a blood-vessel by an embolus (p. 282)

Emmenagogues. Agents that stimulate the menstrual flow (p. 864)

Emprosthotonos. Clonic spasm bending the body forward (p. 574)

Endarteritis. Inflammation of the inner coat of an artery (p. 860)

Endemic. A disease prevalent in a particular locality (p. 330)

Endocarditis. Inflammation of the inner lining of the heart (p. 269)

Enteroptosis. A protrusion of the abdominal viscera between the relaxed muscles of the abdomen (p. 230)

Enterorrhagia. Haemorrhage from the intestine (p. 222)

Enuresis. Involuntary discharge of urine (p. 595)

Epicanthus. A fold of skin over the inner canthus of the eye (p. 860)

Epicondyle. An eminence upon a bone above its condyle (p. 860)

Epidemic. A disease attacking a number of people in the same place at one time (p. 330)

Epiphysis. A process of bone attached by cartilage to the end of bones and from which growth takes place (p. 543)

Epistaxis. Bleeding from the nose (p. 563)

Exocolitis. Inflammation of the outer or peritoneal coat of the colon (p. 223)

Excoriation. Abrasion of the skin (p. 519)

Exophthalmos. Protruding eyeballs (p. 643)

Extradural. Situated outside of the dura (p. 860)

Fastigium. The period in which, though there may be remissions, the temperature remains high (p. 199)

Fistula. Any unnatural passage by which an internal organ or pus sac communicates with another or with the external air (p. 681)

Flatus. Gases in the alimentary canal (p. 209)

Floccilation. Picking the bedclothes (p. 208)

Fomites. Articles of clothing or bedding which have been in contact with a patient suffering from an infectious disease (p. 316)

Galactase. An enzyme of milk. It is a normal constituent, is soluble, and is active in ripening cheese (p. 861)

Galazyme. A fermented drink made from milk and sugar, and a special ferment (p. 860)

Gastrorrhagia. Haemorrhage from the stomach (p. 217)

Genioplasty. Operative restoration of chin, or of cheek (p. 861)

Genu valgum. Knock-knee (p. 621)

Genu varum. Bow-leg (p. 621)

Glossoplegia. Paralysis of the tongue (p. 861)

Glycosuria. Sugar in the urine (p. 236)

Haemagogue. Promoting the menstrual or haemorrhoidal discharge of blood (p. 861)

Haematemesis. Vomiting blood from the stomach (p. 563)

Haematoma. A tumour or swelling containing blood (p. 563)

Haematosalpinx. A collection of blood in a Fallopian tube (p. 683)

Haematuria. Blood in the urine (p. 237)

Haemoglobinuria. Haemoglobin in the urine (p. 237)

Haemopericardium. Blood in the pericardium (p. 275)

Haemoptysis. Coughing up blood from the lungs (p. 259)

Hemialgia. Unilateral neuralgia (p. 388)

Hemiplegia. A stroke; paralysis on one side of the body (p. 477)

Hepatic. Pertaining or belonging to the liver (p. 232)

Hepatodynia. Pain in the liver (hepatic colic, p. 234)

Heteradenia. Normal glandular structure occurring in a part normally not provided with glands; glandular structure departing from the normal type (see goitre, p. 297)

Heteroplasty. Heteroplasia; the operation of grafting parts taken from another species (p. 861)

Homoeopathy. A system of treatment of disease by drugs that in healthy persons would produce its symptoms (p. 865)

Hydrothorax. Dropsy of the chest (p. 191)

Hyperaemia. Excessive blood in a part (p. 190)

Hyperaesthesia. Excessive or morbid sensibility (p. 363)

Hyperemesis. Excessive vomiting (p. 184)

Hyperglycaemia. Excess of sugar in the blood (p. 292)

Hyperhidrosis. Excessive perspiration (p. 412)

Hyperpiesis. Abnormally high pressure, as of blood; blood pressure (p. 203)

Hyperpyrexia. Excess of fever, shown by a very high temperature (p. 195)

Hypertension. Excessive tension; supertension; hyperpiesis (p. 202)

Hypnophobia. Morbid dread of sleep: also nightmare or night terror (p. 355)

Hypocalcemia. Condition in which there is a diminished amount of calcium in the blood (*see* tetany, p. 300)

Hypocardia. Downward displacement of the heart (p. 274)

Hypodermic. Under the skin (p. 84)

Hypodermoclysis (*hypodermatoclysis*). The introduction into the subcutaneous tissues of large quantities of fluids, especially of normal saline solution (p. 82)

Hypoglossal. Situated beneath the tongue (p. 861)

Hypoglycaemia. A lowering of blood sugar below the normal level (p. 291)

Hypopiesis. Subnormal blood pressure (p. 204)

Hypopyon. A collection of purulent matter in the anterior chamber of the eye (p. 534)

Hypovitaminosis. Condition due to need of one of the vitamins (p. 302)

Hysterodynia. Pain in the womb (p. 683)

Ileotomy. Incision of the ileum through the abdominal wall (p. 507)

Iliocolotomy. Colotomy in the iliac region (p. 507)

Immature. Unripe; not yet of adult age or growth (p. 861)

Incontinence. Involuntary evacuation (p. 353)

Indicanuria. Indican in urine (p. 237)

Infarction. The formation of an infarct (p. 282)

Infraspinous. Beneath a spine, as of the scapula or a vertebra (p. 858)

Infratonsillar. Below the tonsil (p. 858)

Ingestion. The act of taking substances, especially food, into the body (p. 858)
Intercostal. Between the ribs (p. 861)
Intradermic. Within the skin (p. 861)
Intranatal. Occurring during birth, or at the time of birth (p. 693)
Intussusception. The reception of one part of the intestine into another (p. 229)
Isocoria. Equality in diameter of the two pupils (p. 629)
Isodactylism. Fingers, or toes, of equal length (p. 614)

Katatonia (*catatonia*). A form of mental derangement progressing from melancholia successively through mania and stupidity to imbecility and tonic convulsions (p. 403)
Kathizophobia. Inability to sit still (p. 861)
Ketosis. A condition in which acetone bodies are found in the body (p. 289)
Kyphosis. Humpback (p. 620)

Labia. Two large folds, constituting the external orifice of the pudendum (p. 672)
Lactose. A sugar found in the milk of mammals (p. 864)
Laryngoscopy. Examination of the interior of the larynx by means of the laryngoscope (p. 865)
Lentigo. Freckles, not due to sunburn (p. 189)
Leucoma. An opacity on the cornea, the result of an ulcer, wound, or inflammation and presenting an appearance of ground glass (p. 634)
Leucopaenia. A decrease below the normal number of leucocytes in the peripheral blood (p. 285)
Leucorrhoea. A whitish discharge from the vagina (p. 684)
Leukotrichous. White-haired (p. 861)
Lientery. A form of diarrhoea, in which the food is only partially digested (p. 186)
Lumbago. Pain in the loins (p. 310)
Lithiasis. The formation of calculi in the body (p. 234)
Lysis. Gradual decline of a fever (p. 159)

Macrobacteria. Very large bacteria (p. 824)
Macrodactylia. Abnormally large fingers or toes (p. 614)
Malunion. Incomplete union or union in a faulty position of the fragments of a fractured bone (p. 533)
Marasmus. A general wasting of the body (p. 601)
Mastoparietal. Pertaining to the mastoid process of the parietal bone (p. 861)
Masturbation. Manual production of excitement of the generative organs (p. 596)

Megacardia. Hypertrophy of the heart (p. 269)

Megalomania. Mania characterized by delusions of grandeur (p. 403)

Melaena. A discharge of black blood from the bowels (p. 564)

Melanochlorosis. Chlorosis in which the skin has a blackish-green hue (p. 284)

Melanoid. Dark-coloured; of the nature of melanosis (p. 314)

Menorrhagia. Excessive menstruation (p. 687)

Mesocolon. The mesentery of the colon (p. 861)

Mesoneuritis. Inflammation of the structures contained between the nerve and its sheath

Metacarpus. The bones of the palm of the hand (p. 861)

Metrorrhagia. Irregular uterine haemorrhage (p. 687)

Micro-organism. A microscopic being of the animal or vegetable kingdom, especially the bacteria (p. 824)

Miscarriage. Premature birth of an infant before the seventh month (p. 705)

Micturition. The act of voiding urine

Monarthritis. Arthritis affecting only a single joint (p. 311)

Monococcus. A coccus occurring singly (p. 824)

Monoplegia. Paralysis of one limb or one side of the face (p. 361)

Morphology. The science that treats of the form and structure of organized beings (p. 861)

Mycosis. A growth of fungi within the body (p. 586)

Myelogenetic. Produced in or by bone marrow

Myocele. The protrusion of a muscle through its ruptured sheath (p. 544)

Myelomeningitis. Spinal meningitis (p. 367)

Myxoma. A connective tissue tumour (p. 862)

Naso-antritis. Rhinitis, combined with inflammation of the antrum of Highmore (p. 659)

Necrosis. Death of a part; usually applied to bone (p. 480)

Neoplasty. The restoration of lost tissue by a plastic operation (p. 471)

Nephritis. Inflammation of the kidney (p. 241)

Nystagmus. Involuntary oscillation of the eyeballs (p. 209)

Obturator. That which obstructs a cavity (p. 862)

Odontalgia. Toothache (p. 861)

Odontoid. Resembling a tooth; tooth-like (p. 862)

Odontorrhagia. Profuse haemorrhage from the socket of a tooth (p. 563)

Oedema. A swelling of a dropsical nature (p. 190)

Oligocholia. A deficiency of bile (p. 862)

Oligodactylia. A condition characterized by a deficiency of fingers or toes (p. 614)

Onycholysis. Loosening of the nail (p. 412)

Onychoma. A tumour of the nail-bed (p. 412)

Oöphoritis. Inflammation of the ovary (p. 682)

Oöphoroma. A dermoid cyst of the ovary (p. 467)

Ophthalmomalacia. Abnormal softness or subnormal tension of the eye (p. 630)

Opisthotonos. A spasm of the extensor muscle, the body being rigidly bent backwards, so as to form a complete arch (p. 584)

Optomyometer. An instrument for measuring the strength of the muscles of the eye (p. 642)

Orchidectomy. Castration (p. 862)

Orchi-epididymitis. Inflammation of both testes and epididymis (p. 862)

Orchiocele. A tumour of the testicle (p. 862)

Organotherapy. The treatment of diseases by means of animal organs or extracts from them (p. 862)

Orthocytosis. Condition of the blood in which only the normal corpuscles are present (p. 862)

Orthodontia. The correction of irregularities of the teeth (p. 862)

Orthopnoea. Breathlessness, the patient being obliged to maintain the erect position (p. 205)

Osmosis. The passage of liquids and substances in solution through a porous septum (p. 305)

Osteopathy. Any disease of bone (p. 865)

Otodynia. Pain in the ear; earache (p. 656)

Otopyorrhoea. A purulent discharge from the ear (p. 657)

Otorrhoea. A purulent discharge from the ear (p. 187)

Otosclerosis. Sclerosis of the tissues of the labyrinth and middle ear (p. 862)

Oviform. Egg-shaped; oval (p. 862)

Oxyaphia. Abnormal acuteness of the sense of touch (p. 862)

Pachyglossia. Thickness of the tongue (p. 207)

Panarthritis. Inflammation of all the structures of a joint (p. 311)

Papule. A small, solid pimple (p. 189)

Paracentesis. Tapping, or making an opening into the abdomen, thorax, bladder, or anterior chamber of the eye or ear (pp. 89, 492, 637, 655)

Paralysis. A total or partial loss of sensation and the power of movement (p. 361)

Paraplegia. Paralysis of the lower half of the body (p. 361)

Parorexia. A craving for special articles of diet (p. 210)

Petechiae. Small localized extravasations of blood beneath the skin (p. 189)

Pharmacopsychosis. Drug addiction (p. 382)

Phleborrhexis. **Rupture of a vein (p. 279)**

Phorotone. An apparatus for exercising the eye muscles (p. 637)

Photophobia. Intolerance of light (p. 631)

Phrenoblabia. Any disorder of the mind (p. 402)

Phrenocolic. Pertaining to the diaphragm and the colon

Phrenocostal. Pertaining to the diaphragm and the ribs (p. 862)

Pleurodynia. Pain in the intercostal nerves (p. 388)

Pleurothotonos. A form of tetanic spasm of the muscles in which the body is bent to one side (p. 582)

Pneumopericardium. Air in the pericardium (p. 275)

Pneumorrhagia. Pulmonary apoplexy; haemorrhage into the air-cells and tissue of the lungs (p. 862)

Pneumothorax. Air in the pleural cavity (p. 264)

Podagra. Gout, especially of the great toe or the joints of the foot (p. 312)

Pododynia. Pain in the foot (p. 862)

Polychoria. The existence of more than one pupil in the iris (p. 629)

Polycystic. Containing many cysts (p. 862)

Polyuria. Excessive flow of urine (p. 243)

Post-natal. Subsequent to birth (p. 862)

Pre-aortic. Situated in front of the aorta (p. 862)

Prochondral. Prior to the formation of cartilage (p. 862)

Proctalgia. Neuralgic pain in the anus or rectum (p. 862)

Proctocele. The extroversion or prolapse of the mucous coat of the rectum (p. 497)

Proctoclysis. The slow instillation of a liquid into the rectum (p. 57)

Proctodynia. Pain about the anus or in the rectum (p. 279)

Prodrome. A symptom indicating the approach of a disease (p. 862)

Prophylaxis. Treatment adopted with a view to warding off disease (p. 317)

Proptosis. Protrusion of the eyeballs (p. 629)

Proximal. Nearest to the body or the median line of the body, or some other point considered as the centre of a system (p. 567)

Ptosis. Droop of the upper eyelid (p. 637)

Pustule. A pimple containing pus (p. 189)

Pyelitis. Inflammation of the pelvis of the kidney (p. 240)

Pyretogen. Any agent which reduces fever (p. 765)

Pyrexia. A state of fever (p. 195)

Pyrophobia. Morbid dread of fire (p. 863)

Pyrosis. Heartburn: an affection of the stomach characterized by a burning sensation, accompanied by eructations of an acrid, irritating fluid (p. 215)

Pyuria. Pus in the urine (p. 237)

Quadriplegia. Paralysis of all four limbs (p. 608)

Radiocarpal. Pertaining to the radius and the carpus (p. 538)
Radiography. Photography by the Röntgen-rays (p. 718)
Radiode. An electric attachment for the application of radium (p. 730)
Radiolucent. Transparent to the X-ray (p. 726)
Retrocervical. Situated behind the cervix uteri (p. 863)
Retromastoid. Behind the mastoid (p. 863)
Rhachicentesis. Puncture into the spinal canal (p. 863)
Rhachiodynia. Spasmodic pain in the spinal column (p. 863)
Rhinaesthesia. The sense of smell (p. 863)
Rhinitis. Inflammation of the nasal mucous membrane
Rhinocleisis. Nasal obstruction (p. 659)
Rhizodontrypy. Surgical puncture of the root of a tooth (p. 863)
Rhizotomy. Section of the posterior spinal nerve roots (p. 491)
Rigor. A sudden attack of shivering with rise of temperature and general malaise (p. 207)

Sacrotomy. Excision of the lower portion of the sacrum (p. 863)
Salpingitis. Inflammation of the Fallopian tube (p. 683); inflammation of the Eustachian tube (p. 657)
Salpingocyesis. Tubal pregnancy (p. 511)
Salpingostenochoria. Stenosis or stricture of the Eustachian tube (p. 657)
Sapraemia. Blood-poisoning due to absorption of toxin from decomposed tissue (p. 711)
Schistocytis. Fissure of the bladder (p. 611)
Schistorrhachis. Spina bifida (p. 610)
Schizaxon. An axon which divides in its course into equal or nearly equal branches (p. 863)
Schizoblepharia. Fissure of the eyelid (p. 863)
Scleroderma. A disease characterized by a progressive induration of the skin (p. 863)
Scoliosis. Lateral curvature of the spine (p. 620)
Scybalae. Faeces passed as hard dry masses (p. 222)
Semi-lunar cartilage. Resembling a half-moon in shape. Two articulating cartilages of the knee (p. 863)
Sepsis. The condition of putrefaction (p. 428)
Sequestrum. A portion of dead bone in living bone (p. 518)
Serodermatosis. A skin disease characterized by serous effusion into the tissue of the skin (p. 418)
Sero-enteritis. Inflammation of the serous covering of the small intestine (p. 863)
Sexidigital. Having six fingers or six toes (p. 863)
Sinus. A channel leading from an abscess, or some inner part, to an external opening (p. 659)

Slough. Dead tissue which has been separated from the surrounding healthy parts by the process of inflammation (p. 518)

Sordes. Brown crusts about the lips and teeth of a feverish person (p. 189)

Spastic. Pertaining to or characterized by spasm

Splenocele. Hernia of the spleen; tumour of the spleen (p. 509)

Sporophore. The portion of the fungus bearing the spores (p. 863)

Stenosis. The contraction or obstruction of an organ (pp. 269, 636)

Stereocyst. A hard cyst or cystic growth (p. 863)

Stertor. Snoring (p. 205)

Stethoscope. An instrument making patient's heart action and other internal sounds audible to user (p. 863)

Stethospasm. Spasm of the pectoral muscles (p. 863)

Stomatitis. Inflammation of the mouth (p. 214)

Stridor. A hissing or whistling respiration (p. 205)

Subaxillary. Situated below the axilla (p. 863)

Subconjunctival. Situated beneath the conjunctiva (p. 863)

Subinvolution. The imperfect contraction of the uterus after delivery (p. 863)

Sudamina. A disorder of the sweat glands with obstruction of their ducts (p. 413)

Sulphite. A salt of sulphurous acid (p. 864)

Supercilium. The eyebrow (p. 863)

Superflexion. Excessive flexion (p. 863)

Supratonsillar. Above the tonsil (p. 863)

Synarthrosis. A form of articulation in which the bones are immovably bound together without any intervening synovial cavity (p. 863)

Syncope. A sudden suspension of the heart's action (p. 276)

Tachycardia. Very rapid action of the heart (p. 277)

Tarsotomy. Operation upon the tarsal cartilage (p. 863)

Tenesmus. A vain endeavour to evacuate the bowel (p. 224)

Teratoma. A tumour containing teeth, hair, and other material not found in the part wherein it grows (p. 467)

Thermohyperaesthesia. Abnormal sensitiveness to the application of hot bodies (p. 863)

Thrombosis. The formation of thrombi (clots) in the organs of circulation (p. 281)

Thyrochondrotomy. Incision of the thyroid cartilage (p. 863)

Thyrotoxicosis. Poisoning by thyroid secretion. Exophthalmic goitre (p. 298)

Topoanaesthesia. Inability to locate exactly a cutaneous sensation. (p. 363)

Toxaemia. Blood poisoning (p. 577)

Toxicoderma. Disease of the skin due to poison (p. 863)

Toxicosis. A state of poisoning (p. 863)
Toxonosis. An affection resulting from the action of a poison (p. 863)
Trachelomyitis. Inflammation of the muscles of the neck (p. 863)
Transmission. The communication or transfer of anything, especially disease, from one person or place to another (p. 330)
Traumatism. The state induced by an injury (p. 710)
Trichiasis. A state of abnormal position of the eyelashes, so that they produce irritation by friction upon the globe (p. 863)
Trichopathy. Any disease of the hair (p. 363)
Tricuspid. Having three points as the right auriculo-ventricular valve of the heart (p. 271)
Tuboperitoneal. Relating to the oviduct and the peritoneum (p. 863)
Tympanites. A distended state of the abdomen caused by gas (p. 209)

Unilateral. Pertaining to or affecting but one side (p. 863)
Urinary proteose. As the presence of antigens in urine has been proved by experiment, a method was evolved of concentrating these antigens, by separating the protein and carbohydrate content of the urine, the substance obtained being termed a 'urinary proteose' (p. 312)
Urodynia. Painful micturition (p. 245)
Uteroplasty. A plastic operation on the uterus (p. 864)

Venesection. Bleeding, puncturing a vein to let out blood (p. 82)
Vertigo. Giddiness, dizziness, a sensation of lack of equilibrium (p. 211)
Vesicle. A blister (p. 189)
Vibices. Small linear haemorrhages under the skin (p. 189)
Vitamins. Chemical substances found in certain foods. Many varieties have been distinguished. They are entirely different from one another in their effects upon life: all are indispensable (p. 784)
Volvulus. A twisting of the bowel (p. 510)
Vulva. The external organs of generation of the female (p. 672)

Xenogenous. Caused by a foreign body (p. 864)
Xenophobia. A morbid fear of meeting strangers (p. 394)
Xeroderma. An abnormal dryness of the skin (p. 864)
Xeromycteria. Lack of moisture in the nasal passages (p. 864)

Zoophobia. Morbid dread of certain animals (p. 864)

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A

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